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Bechtel's Crab

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Disease-Resistant and Hardy Varieties of Vegetables

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Most readers of this magazine long have been interested primarily in the ornamental, the esthetic side of horticulture, rather than the practical side that deals with food production. Now, however, it seems safe to say that there is quite as much interest in making our gardens contribute to our physical welfare as in making them contribute to our enjoyment of beauty. The radio and press are full of information for the beginning vegetable gardener, especially on cultural methods and the control of insects and diseases. Comparatively little, however, in that intensive campaign is directed to the experienced horticulturist because it is rightly assumed that he already knows a good deal about how to grow plants. In our intensive efforts to teach millions of beginners and slightly experienced gardeners, the minimum requirements for success there has been little opportunity in the popular press to present much of the wealth of background information that would interest gardeners. Unless one has been especially concerned with the best obtainable vegetable varieties for some years it is probable that many experienced growers of ornamental plants are unaware of the great and rapid strides that are being made in the improvement of vegetable varieties.

THE OLD VERSUS THE NEW

Most of the vegetable varieties that home gardeners grow nowadays are relatively old, some of them very old. For generations America has been fortunate in having a succession of many alert, progressive, practical seedsmen who have sought constantly for varieties of greater productiveness and better eating qualities. Among them have been some excellent "practical" plant breeders and selectors of superior chance finds. The long persistence of varieties developed by them and the very high quality of many of the old varieties attest the good judgment and painstaking works of those men who antedated the science of genetics by many years. We are indebted to them for many of our present-day varieties and must not underrate their accomplishments.

As the culture of most vegetable crops has become intensified and extended, oftentimes under systems of management that are especially conducive to the increase of their natural enemies, those enemies—bacteria, fungi, viruses, insects—have seriously damaged many old varieties. Furthermore, many varieties that are excellent in the region of their origin have encountered serious diseases when grown in distant regions, diseases that do not exist to plague those varieties where they originated. It is hardly a case of the old varieties "running out" so much as enemies "running in" upon them.

Some of the good old sorts really "aren't what they used to be" because seed stocks have been carelessly handled and allowed to become mixed—both through cross-pollination and through mechanical mixture of the seeds—with other and inferior kinds. Contamination of seeds with seed-borne diseases has also contributed to the bad reputation that some erstwhile good va-

rieties have borne.

Thus, the increasing intensity of diseases, appearance of new strains of disease-causing organisms and viruses, unfavorable new places of culture, and just plain mechanical difficulties in seed production have combined to cause poor performance or failure of some excellent old varieties. What is being done about all this, and with what success? The full answers to those questions could easily fill a book, a book that would hold, to the very end, the interest of any true plantsman, regardless of his special field. In a few words, the answer is that a large number of public agencies and private companies have been breeding new disease-resistant varieties for several years, so that an ever-increasing and imposing array of superior new kinds is becoming available. These new kinds do what the old ones that they are replacing could not do. They not only stand up to certain diseases, but some of them resist heat, or cold, or other conditions that were too unfavorable to permit success; and quality is not forgotten.

Modern plant breeders have been unfairly and erroneously accused of two failures: (1) Failure to consider eating quality of their productions; (2) failure to consider the needs of the home gardener. On the whole, they are devoting special attention to eating quality as well as to yield and keeping quality; and some agencies are breeding specifically for higher vitamin content in addition to other desirable characters. Varieties are being developed especially for home gardeners in regions and for seasons in which no important plantings now occur, and in which the old sorts cannot be grown successfully.

This story about disease-resistant vegetables will deal mainly with some of the more recent accomplishments, but will include also reference to some of the earlier productions. It is intended not as a complete catalog of the results in breeding disease-resistant or otherwise improved vegetables but as an account of the origin and usefulness of the more important improved kinds in which gardeners are likely to be interested today.

Some Early Accomplishments

One of the first efforts in breeding for disease resistance in vegetable plants was that of J. B. Norton in producing a new variety of asparagus (about 1910) that would resist rust, a very destructive disease in the humid parts of the country. He selected from large field plantings of the Reading Giant variety the rarely occurring individuals that were comparatively free of rust and also otherwise superior while the rest of the field was seriously damaged. Selected males and females were crossed in various combinations and selections of the most promising progenies named and released as new varieties. Mary Washington, the most important asparagus variety in America for the past 25 years or so, is one of these. It is so generally grown that asparagus rust is now rarely an important problem. Also, Mary Washington is such a good variety that it is extensively grown in areas where no protection against rust is needed.

As long as 25 or 30 years ago cabbage yellows or fusarium wilt was causing very serious losses in the territory about the Great Lakes. Entire fields were being devastated. The fungus causing the trouble lives in the soil many, many years and it is the same kind of organism as those causing fusarium wilt of watermelons, of tomatoes, of peas, and of many other crops. The Wisconsin Agricultural Experiment Station and the U. S. Department of Agriculture selected the rare undamaged plants from seriously affected

fields and from them—by selection—developed the first yellows-resistant cabbage. It was called Wisconsin Hollander and was selected from within the old Hollander or Danish Ballhead, a late storage variety. This first resistant strain of Hollander was a "lifesaver" at the time it was produced (1916), for it could be grown with success on infected land—and most of the land in certain cabbage-growing districts had become infected. Unfortunately, however, its resistance was not high, only intermediate, and it was often damaged. It was somewhat coarse, irregular, and far short of ideal, but of great importance in those areas for about 20 years. A few years ago discoveries of a new type of virtually complete resistance permitted the breeding of much-improved, still more resistant kinds of many sorts of cabbage, including the Ballhead types. Even so, Wisconsin Hollander is still grown today.

Another early accomplishment (1911) was the production of the first wilt-resistant watermelon, Conqueror, by workers in the U. S. Department of Agriculture. Unfortunately that work must be considered incomplete. It was a big step from the technical point of view because it involved the crossing of a rather inedible, wilt-resistant citron or stock melon, with a good watermelon, followed by selection, to obtain a new watermelon that was resistant. The new melon, however, never became popular because its eating quality was not good enough. Even so, it showed how wilt resistance of one parent could be combined with other desired qualities of the other parent to obtain a better new kind. Now there are numerous high-quality wilt-resistant varieties of watermelon, of which more will be said later.

About 1920 a still more striking development was completed by the Virginia Truck Experiment Station. In searching for a variety of spinach that might resist the devastating effects of the so-called "blight"—really mosaic, a virus disease—all possible kinds and varieties of spinach obtainable were grown in the fall under conditions conducive to infection and damage. All commercial kinds were very susceptible. Finally the workers located a few seeds of a wild spinach that had been brought to this country from Manchuria by Frank Meyer, an explorer of the Division of Plant Exploration and Introduction of the U. S. Department of Agriculture. This wild spinach was found to be highly resistant to mosaic and to cold, but it was utterly worthless as a horticultural crop. It was crossed with the common Bloomsdale Savoy type of spinach and from the progeny of this cross high-quality garden- or market-type plants were selected that had the mosaic resistance of the wild Manchurian parent. One of these selections was named Virginia Savoy and became the variety that literally saved the fall and winter spinach-growing industry of the Middle Atlantic Coastal States. Virginia Savoy was the mainstay of the fall and winter spinach growers for over 15 years, but is now yielding to a newer variety of superior horticultural value, Old Dominion, of which it is one of the parents. These two varieties are suited for growing only in the fall because they shoot to seed quickly in the spring.

This instance of the wild Manchurian spinach was probably the first in which a rather distant relative of one of our vegetable crops was brought from afar by our Government's explorers to be used as a parent in breeding to solve a serious problem. In recent years, however, an ever-increasing use is being made of such plants and such methods in developing new and improved varieties to meet exacting requirements.

Later Accomplishments

By the early 1920's, breeding for disease resistance had been well demonstrated as a very practical method of avoiding damage from vegetable diseases that could be controlled in no other profitable fashion. From that time onward an ever-increasing effort has been made all over the country to control diseases through breeding, not only those troubles that can be controlled only through breeding, but also to eliminate costly and troublesome spraying or other artificial controls. As geneticists, practical plant breeders, plant pathologists, and horticulturists learn more about how plants and their enemies behave, faster and more effective methods are being developed. New varieties are now being turned out in such rapid succession that it is not easy to keep up with them. Some marked improvements in quality and yield are appearing that are not accompanied by resistance to disease. Of those crops, however, of which varieties resistant to one or more diseases have been developed, breeders are now reluctant to put out new sorts that possess no resistance to any disease.

It should of course be borne in mind that our use of the expression "disease-resistant variety" is rather loose. It does not mean that the variety is resistant to all diseases, or necessarily to more than one. Furthermore there are various kinds of "wilt," of mildew, of mosaic, etc. A variety resistant to one kind of wilt or of mildew, for example, is not necessarily resistant to another—indeed, it rarely is. Thus, in considering the possible adaptability of a "disease-resistant variety," it is essential to know exactly what disease or diseases it is resistant to, and what diseases it is likely to encounter in a particular region or area.

The terms "hardiness" or "hardy" are purely relative, and too much should not be read into them in these pages. Although definite improvement in tolerance to adverse temperature or drouth has been obtained in many new sorts, no one has yet produced such things as bean or tomato plants that will survive freezing of their tissues, or that can grow well without at least a fair amount of water.

Beans

One of the first commercially successful efforts to breed a disease-resistant bean resulted in the Robust, a variety of dry "pea-bean" or "navy bean" for field culture, that is resistant to mosaic. It was produced by the Michigan Agricultural Experiment Station about 1913. This variety is of little interest to gardeners but is of historic interest here. There are now many mosaic resistant field beans.

Success in breeding resistance to disease in snap beans has come only recently, chiefly because the problem was not attacked vigorously until a few years ago. Most vegetable gardeners are familiar with bean rust, a disease of which about two dozen forms or strains are known to pathologists. Kentucky Wonder U. S. No. 3 and No. 4 are two selections from European pole beans of the Kentucky Wonder type that are resistant to some forms of rust but not to all forms, and some other rust-resistant strains are on the market. The only way for the home gardener to determine if any of these are resistant to the particular form or forms of rust prevalent in any locality, is to try them and see how they stand up in comparison with the common strains of Kentucky Wonder. There is nothing to lose by trying them.

Snap beans of the old Refugee or Thousand-to-One type are generally susceptible to mosaic. The U. S. Department of Agriculture developed a Refugee type, Refugee U. S. No. 1,

resistant to mosaic, by crossing Wells Red Kidney with Stringless Green Refugee. In the course of that work the breeders developed an unusual breeding strain from a chance rogue or off-type plant that happened to be immune to common bean mosaic and that was found in the Stringless Green Refugee variety. This rogue line was very unstable and undesirable except for its immunity to mosaic. It entered into a large number of crosses made by several breeders but its undesirable characters kept popping up in selections from crosses with it, seriously limiting its usefulness. The Refugee U. S. No. 1 was crossed with this Corbett Refugee and gave rise to Refugee U. S. No. 5, which was introduced in 1935. This last variety is a bush bean grown chiefly in northern bean-canning districts where mosaic is destructive to the older strains of Refugee, but it is gaining favor also as a home garden bean in the South. Although it was bred for canning purposes in the North, it has shown a surprising tolerance to hot weather in the Middle South where other beans fail when planted in late spring. It remains to be seen how far this surprising adaptability will take it, but it appears well worth wider trial.

Idaho Refugee (developed by the Idaho Agricultural Experiment Station), Refugee No. 1066 and No. 1071 (developed by Rogers Bros. Seed Company), and Medal Refugee (developed by Associated Seed Growers, Inc.) are four more mosaic-resistant kinds of the Refugee type. Refugee U. S. No. 5 and Idaho Refugee also have a little resistance to blights.

The Alabama Agricultural Experiment Station has recently developed a pole variety called Alabama No. 1, that is resistant to the root-knot nematode. It was developed by selection from an old home garden bean long grown in the South under conditions where nematodes are generally destructive. The parent stock or variety had apparently undergone considerable long-time selection by home gardeners who had saved seed from plants that survived nematode attacks. The variety is not known to be suited to areas outside the South. It produces moderately long, nearly round, nearly straight pods splashed with purple.

The California Agricultural Experiment Station has produced a number of nematode-resistant lima beans: Hopi 5989 (pole), Hopi 12 and Hopi 13 (semi-erect). These were developed from the lima beans long grown by the Hopi Indians of the Southwest. They are all very late kinds that are adapted to the warmer parts of California. They definitely are not adapted to the middle and northern parts of the country.

Only last year the U. S. Department of Agriculture and the Oregon Agricultural Experiment Station released the first curly-top resistant variety of snap bean to be produced, under the name of Pioneer. Curly-top is a virus disease that occurs only in the intermountain and Pacific Coast States, but often is so serious as to ruin all other snap bean varieties. Pioneer is so new that seed is not yet generally available for sale, and it should be grown only in areas where curly top occurs.

Low Growing Native American Flowering Trees

HELEN M. FOX

National barriers to plants in the garden have never existed, the only passport required whether for herb, shrub or tree, was that the candidate should be hardy, handsome and suitable. Frequently Asiatic or European plants do as well, or better, than natives, but it is amusing to know where plants come from and to be reminded that many of the most ornamental specimens are native.

In favor of growing native plants it might be said it is a joy to create the scenery around one's home with plants that grow in woods or along margins of streams in valleys nearby. In the front yard, every phase in the development of a redbud, dogwood or Franklinia can be watched from the unfolding of winter buds on through the opening of flowers, to the fall of the last flaming leaf in autumn, without having to stalk through underbrush, pick one's way through muddy swamps or leap precariously over stones in partly frozen streams. Then, too, under cultivation, a tree or shrub has space to develop on all sides and can expand to the fullest and often takes on a form it does not have in the wild where it must compete with other plants for light, space and food.

The ten small trees described in these pages all thrive so well in the garden that many of them self sow like weeds. Most of them do not grow higher than twenty or thirty feet, and since they grow very slowly, stay low a long time and consequently fit well into small grounds, all are hardy as well as good looking.

In spite of intensive education in garden planning on the part of garden clubs, lecturers, periodicals and books, many small places, today, are "landscaped" with a green lawn leading from the street to a band of evergreens crowded stiffly at the base of the house. These evergreens are frequently of a variety that quickly grows into tall trees and if left unpruned will shortly darken the windows of the ground floor rooms. Instead of such a scheme, one or two flowering trees planted on a lawn, break the monotony of the green carpet, bring a ravishing display of bloom in spring or summer, and are sometimes handsome in fall because of vivid foliage and colorful fruits. Under the trees can be planted low growing, shade loving flowers that bloom at the same time, to make a picture and bring color down to the foreground, such as creeping phloxes, *Vinca minor,* forget-me-nots or violas.

A tree usually differs from a shrub in having a single trunk instead of a cluster of stems, but distinctions in nature have a way of shading off gradually, so a few trees are included which may have several trunks, such as magnolias, although often they can be pruned to a single trunk.

It is important to plant a tree well and give it a good start by providing soil with readily available food and capable of holding the required amount of moisture and no more. A hole is dug one-third larger than the circumference of the roots and the bottom filled with top soil or other humus. Then the tree is stood in the hole, the roots are spread out flat so they will not be bent or twisted. More humus is

sprinkled over them to cover them and the rest of the hole filled almost to the surface with earth, a depression of several inches being left for a few weeks to facilitate watering. For the first year the tree is watered when there is not enough rainfall, and given a mulch of leaves to help keep the ground moist. A winter mulch of manure or compost enriches the soil but is not put on the first year in order not to overstimulate the plant before it can grow healthy rootlets. As soon as the tree has taken hold, a colorful carpet of low-growing flowers can be planted under it.

Dates of bloom given are for my garden in southern New York. The time varies from year to year as much as two weeks, due to amount of rainfall and degree of warmth. Plants on dry hillsides will flower earlier than denizens of damp valleys, but within the two week period no matter what the weather, even when the ground is frozen hard, if the length of day is right for a daffodil or dogwood to blossom, it will. By June the schedule, with a little variation, settles down to a routine of other years.

When the dogwoods, *Cornus florida,* are in flower from eastern Massachusetts to southern Ohio, and Kansas, and west to Texas, south to central Florida, they are the most conspicuous trees in the landscape, their white floral bracts glimmering through the branches of deciduous forests, faintly green in early spring. The gardener who collects the seeds before the birds eat them, can plant them in average garden soil with good success. I have raised them and planted a long walk ten feet wide with the snowy trees, twenty feet apart, and trained them into standards by gradual pruning. Cutting off too many branches at a time weakens the trees and sometimes causes borers to come. A few pink flowering trees with the white along the walk enhance the effect. My trees rise from a carpet of *Vinca minor* behind which is an irregular line of fluffy blue *Phlox divaricata* interspersed with late blooming narcissi. A dogwood is so striking with its gleaming snowy flower bracts that in a garden single specimens should be placed preferably in a conspicuous position, instead of dotting them about, which lessens their effect; being forest trees they do best in partial shade. They are a little difficult to move and spring seems to be the best time. The brown branches grow horizontally and in time the trees form wide topped plants, generally twenty feet high but occasionally much taller.

The name of this lovely tree is odd and there have been unconvincing explanations for it, such as the word "dog" meant contempt or that it came from the scaly bark that is astringent and has been used to cure mange. Other popular names for the tree are Indian arrowwood, boxwood, cornelian tree, white cornel and florida cornel. The bark was formerly considered a mild tonic or slight stimulant and was given for malaria and dyspepsia and because of its astringent properties was administered in the treatment of intestinal disorders.

The four white petal-like bracts surround a cluster of tubular greenish flowers ½-1 inch long. These grow on the upper part of the branches and a tree in full bloom looks as if a heavy fall of snow were resting on it. The buds formed in summer are light grey, round, tinged maroon and velvety. These are the bracts, that in my garden, begin to open the end of April, at first reddish, then turning green and as they increase in size slowly paling to snowy white. They measure over four inches across and there is a notch in the centre at the tips of their oval outline. The leaves develop after the bracts fall and are opposite, pointed at

the tips and with the stalks of a pair joined at their bases. The foliage of dogwoods is almost the first of all trees to color in autumn and becomes a tone between carmine and nopal red, a warm brilliant color, while the elongated glossy fruits covered with tiny hairs are bright red. The birds like them so much they stop on their way south in chattering swarms to feed upon them. The flower bracts of the pink form, var. *rubra* vary in depth of color on different trees, from pale to deep pink. The winter buds of the pink forms are a darker maroon and have less white on them. There is a double form *pluribracteata,* not nearly so handsome as the single, and one with yellow fruits, *xanthocarpa.* The wood, according to Professor Charles Sprague Sargent, in his book, "Manual of Trees of North America," is heavy, hard, strong, of close grain and used in turnery for bearings of machinery, hubs of small wheels, barrel hoops and handles of tools.

Along borders of streams, or shimmering between trees, in woods, from New Jersey, south to Florida, and west to Texas and New Mexico, grow the ethereal looking red-buds, or Judas trees, their graceful elm-shaped outlines emphasized in early spring by violet blossoms. Before the buds open the branches look as if they had been tinted purple and after the blossoms unfold, since no leaves are out, when the tree is lit by the sun, it becomes the most glorious object in the spring garden. Every plant combines well with red-bud but especially handsome are a dark purple carpet of violas spread beneath and early lilac bushes alongside. In my garden, which is a little further north than is natural for it, red-bud demands good soil, slight shade, and sufficient space to develop though a woodland tree in the wild. When it is crowded, or the shade is too deep, branches die off without apparent cause. The stems are round, dark, grey-brown and marked with tiny dots and lenticels.

The flowers grow in close clusters of 8-10 and are irregularly placed on stems and branches. When examined closely the pea shaped flowers, instead of being all violet as they appear from a distance, are subtended by tan-pink furry bracts and have pink-brown stems ½ inch long, while the calyx is rosy-magenta and the flower petals pink-violet. The flowers fall without losing much color and form a vivid purple carpet under the tree. Then the leaves open, at first, tiny, glossy and tinged brown, and soon maturing into an almost round form except for an abrupt point at the apex and measuring 3-4 inches across. The veins converge at the base and where the stem joins the leaf, there is a thickening as also on the stem below the leaf, said to be remains of an obsolete leaf structure—a structure typical of the pea family—according to Charlotte Hilton Green in her book "Trees of the South." The fruits are flat, elongated pea pods and the foliage in fall, a pretty tone of yellow. There is a white form, called *alba* I have seen growing in South Carolina and Georgia, and I was delighted to find hardy in my garden, having lived through the extreme cold of last winter without injury.

There are several species of Silverbell, or Snowdrop trees, *Halesia* of the Storax family. In my experience the best one to grow is *Halesia carolina,* native from West Virginia to Florida and west to Texas and hardy throughout Zone IV according to Dr. Alfred Rehder, in his "Manual of Cultivated Trees and Shrubs." *Halesia carolina* rises to thirty feet. I have found it a most amenable tree and when I moved three of them the tops of one died back but new shoots came up and the tree grew into a good sized specimen. The tree thrives in both sun and shade. The

Walter Beebe Wilder

Fringe Tree—Chionanthus virginiana

narrow shapes are attractive but Halesias are at their best in mid-May (in my garden) when the young, partially open leaves are tinged brown and the bell-like flowers first tinted tobacco pink, soon paling to white, hang in clusters from the branches. Close to them are planted pink flowered *Rhododendron vaseyi* and blue *Mertensia virginica.* The bark is orange-tan marked

with horizontal scaliness. The leaves which are about three inches or a little more long, feel soft because of their hairiness and have serrated margins, each tooth terminating in a point. The pedicels of the flowers are woody and swell into furry ridged calyces. The bell-shaped corollas separate into four rounded lobes, slightly reflexed and measure ¾ of an inch across and the same in length. In autumn the leaves turn yellow and the fruits with four wings, are green and not interesting looking. The trees can be raised from seed.

Not blooming until after the petals of other ornamental flowering apples have fluttered to the ground, is Bechtel's Crab, or Prairie Apple, *Malus ioensis* var. *plena*, a rounded tree with spreading branches, rising to thirty feet, but generally lower. The flowers 1-2 inches across, resemble double pink roses and exhale a fragrance of apple with a dash of heliotrope and they bloom when the leaves are barely out. The flowers are so full and grow so thickly in cymes of 3-5 the whole tree looks pink against the sky of late May and is positively breath-taking. I recommend a carpet of low blue *Iris cristata* and above it, here and there, clumps of deep blue *Camassia esculenta*. The bark is dark grey marked with lenticels of darker tone. The whole tree is softly hairy, especially the young portions. The leaves are lanceolate with doubly serrate margins and when young are soft to the touch, but lose their hairiness as they age. The calyx of the flowers is coated with thick hairs as are the pedicels. The petals of the double corolla have the thin texture of *Rosa damascena* and like those of the rose, narrow to a clawlike base tipped yellow. Their color is "pale rhodonite pink" shaded a little deeper over a white base. The doubling has rendered the flowers sterile so there are no fruits. The tree grows in the sunlight and since it is subject to the same diseases as other apples, one or two sprayings of Bordeaux, to keep the foliage clean, are recommended, to be applied when the orchard is being sprayed. This enchanting tree is found wild from Minnesota to Missouri, and since it is hardy in Zone II should be the first ornamental tree chosen for cold climates.

The woods in North America are full of plants with medicinal properties known to Indians and early settlers. One of these is the fragrant Fringe-tree, Old Man's Beard, or Snowdrop tree, in Latin, *Chionanthus virginica*. The dried root or the bark has been given in decoctions to cure catarrh, jaundice and intermittent fever for its aperient and diuretic properties and in the form of a poultice was applied to wounds and other external irritations. The tree grows very slowly, to thirty feet. It grows along banks of streams in rich, moist earth from southern Pennsylvania to Tampa Bay in Florida, and westward through the gulf states to Arkansas and Texas. However, as with so many southern plants, it is hardy north of its natural habitat, throughout Zone IV. In my garden, the end of May, the whole bush is faintly green with leaves beginning to unfold and filmy with fringe-like dropping panicles of cream-white blossoms, that exhale a delightful perfume. The flower clusters grow from lateral buds near the end of the previous year's growth and are four inches long. The tiny calyx is pale green with four sepals and the corolla tube 1⅛ inch long has four narrow petals cut nearly to the base which produce the fringe-like effect of the panicle. After the leaves mature they are smooth, green, obovate, pointed at the apex and narrowed to a stalk-like base. They are about 5½ inches long and 1¾ across. Yellow lady-

slippers, shooting stars (*Dodecatheon Meadia*) or sweet woodruff, are charming at the feet of this tree, that thrives in slight shade or full sun.

The trees described have been at their height in May. In early summer there are late blooming forms of magnolias, to beautify the garden.

Once upon a time along the Hudson River there was a lovely large garden planted with handsome magnolias. The owner died and the garden was divided into lots and houses erected upon them. In the course of time, these streets became a slum, but the magnolias still rise high on their grey trunks and when in bloom bestow a glory to the dingy quarter with their roseate and white blossoms. The moral of this tale is to plant magnolias or other handsome trees for posterity.

From Washington south, magnolias are our handsomest trees with their glossy leaves and waxy, heavily scented flowers.

There are so many species and varieties hardy in North America it is difficult to pick one only for the garden, therefore I follow the advice of E. H. Wilson who wrote of *Magnolia virginiana* in "Aristocrats of the Trees," —"There is not a more delightful North-American tree to plant in gardens nor one that will give larger returns in beauty and fragrance." The tree was formerly called *Magnolia glauca* and is popularly known as swamp bay or sweet bay. It grows in shallow swamps from Massachusetts where it is a shrub to Louisiana where it is a tall tree, one specimen being recorded with a trunk having a girth of 6-10 feet. The branches, when young, are slender bright green and with a hoary hairiness that soon disappears and they are marked by narrow, horizontal, pale lenticels which by their second summer become bright red. The leave with conspicuous midribs are oblong or oval and though hairy at first, in maturity, are glossy, bright green on the upper surface and pale or white with hairiness on the under. In the North the leaves fail in early winter but in the South stay on until new leaves push out in spring. The flowers, as with most of the family, are strongly scented, and open over a long period from May to July and occasionally even into August. They are cream-white changing to peach, are waxy, cup-shaped and with petals folding inwards. They measure 2-3 inches across and when they ripen turn into dark red coneshaped fruits about two inches long. In my garden magnolias have done best where the ground is shaded or there is partial shade on the tree. The bark yields an aromatic tonic with diaphoretic properties and as a medicine has been substituted for Peruvian bark. I keep cutting off the stems of my magnolias to gradually trim them to a single trunk, but it must be done very gradually. According to Wilson, *Magnolia major*, or *Thompsoniana*, probably a hybrid is an intermediate form between *virginiana* and *longifolia* and a favorite garden plant in North Eastern America and England. Under magnolias, the glossy leaves of *Galax aphylla* look attractive, the flowers of the tree are so stunning it would seem a mistake to plant others nearby.

When William Bartram went on a plant exploring trip with his father John, he wrote on August 27, 1777 that they left Mobile by boat for Taena and rode thence on horseback to Savannah where they remained long enough to make several side trips in Georgia as well as the east borders of Florida. On one of these trips they noticed a flowering shrub "of the first order for beauty and fragrance of blossoms." Later when writing of the plant William Bartram spoke of it as a tree. "This very curious tree was first taken notice of

about ten or twelve years ago when I attended my father on a botanical excursion; but being late in autumn we could form no opinion to what class it belonged and we never saw it grow in any other place." They thought at first it was a Gordonia but decided it was not and called it *Franklinia alatamaha* in honor of Benjamin Franklin. The tree was never found growing wild again and all cultivated specimens are descended from the plant grown by the Bartrams in their garden outside of Philadelphia. The name has swung back and forth. W. J. Bean, Sargent and Dr. Bailey, call it *Gordonia* while Dr. Rehder calls it *Franklinia*. It is a beautiful small tree and in spite of its place of origin on the banks of the Altamaha River, is hardy in Zone V. It begins to bloom in August and continues into October bearing waxy, white cup-shaped blossoms similar to camellias—a close relative since both belong to the tea family—and continues to bloom after the leaves have turned crimson. The tree grows slowly and has been reported to grow thirty feet high. Some say it should face north. My Franklinia faces the South, is protected from the North, and grows in partial shade in acid soil along with azaleas and rhododendrons. The trunk is reddish brown with a suede-like finish, the leaves come out late, grow in clusters of four or more and are obovate, terminate in a point and narrow to a base. They are stalkless and finely serrate along the margins with hairs projecting and measure 5 inches long and 1⅜ across. In summer the leaves are tinted madder brown over green and in fall they become vivid crimson. The flowers grow below the clusters of leaves, are delicately fragrant, short stalked with five overlapping petals of cream-white, and crinkled, with the outermost petal which is the smallest bulging and tinted green and rose. The flowers measure 2-3 inches across and have numerous stamens, their orange filaments tipped with lighter yellow anthers, while the pistil is four-parted and the stigma green.

A second member of the tea family, and also from the South, is the Stewartia, the American species native from Virginia and Arkansas to Florida and Louisiana. *Stewartia ovata* is a shrub 15 feet high, said to be hardy in Zone V while *Stewartia melachodendron* is said to be hardy in Zone VII. I had a small tree labelled *melachodendron* and am not certain the name is right. However, it is hardy for me and grows in a protected spot on a slope. Both Asiatic and American species grow slowly into small trees with handsome, pointed, winter buds and narrow, dark green leaves, soft textured when young, pointed at the tips with margins slightly denticulate and little hairs projecting. The leaves turn dark red in Autumn. The flowers open a few at a time from July through August and are white, camellia-like, and without fragrance.

Autumn is the most exciting season in the North American landscape and I have often thought should be the time to plan for effects as much as in spring. We have such handsome berried shrubs and so many trees and shrubs with gorgeously colored autumn foliage. Two trees at their best in fall are the hawthorn and mountain ash.

American hawthorns do not lend themselves as well for hedge plants as does the European *Crataegus oxycantha* but they are handsome as specimen trees or to give height to a mixed planting of lower shrubs. They are at their best in fall with vivid foliage and scarlet fruits, sometimes used for jellies. The movement of the trees is horizontal and in late May they are white with corymbs of blossoms born flatly on top of the branches and giving forth—to me —an unpleasant smell, reminiscent of a

Walter Beebe Wilder

Sorbus americana

bitter taste. The fruits are a favorite food of birds, so that in most instances their glory is short lived and that is one reason *Crataegus nitida*, shining thorn, has been chosen for these pages from the myriad of hawthorns, for the fruit, ovid hairy and bloodred, hangs in vivid drooping clusters more or less untouched until spring. The tree reaches thirty feet but is generally lower and frequently without thorns. The leaves are most attractive, being glossy on the

upper surface, with serrate margins often slightly lobed and turn brilliant scarlet-orange in fall. The flowers are ¾ of an inch in diameter. One of the ways of distinguishing hawthorns is by the number of stamens, in this case, 15-20 and the color of the anthers, here pale yellow, while the styles are 2-5. The tree is native to the Mississippi valley and grows abundantly opposite St. Louis. According to Professor Sargent the wood is heavy, close grained and used for handles of tools, mallets and other small articles. Bushes of *Callicarpa purpurea*, beauty berry, and perhaps a few of the euonymus, such as the Wahoo, or the Asiatic *Maacki*, with brilliant fruits are stunning companions for autumn effect along with the hawthorn.

When mountain ash is conspicuous with clusters of orange fruits, visitors always ask whether they can be used for jellies. The fruits are astringent, and evidently rich in vitamins, having been described as antiscorbutic in old books, but I hear they do not taste well. American mountain ash, *Sorbus americana*, also called dogberry, belongs to the Rose Family. It is one of the hardiest ornamental trees growing from Labrador to Manitoba and south to North Carolina and Michigan, and reaches thirty feet. There are usually several trunks and they have silky dark grey bark marked with horizontal warty lines. The leaves are compound with 11-17 toothed and pointed leaflets, their central stem is tinged red and is hairy. The leaf is about 11 inches long and 4 wide. The flower clusters, actually cymes, are composed of tiny florets intermingled with round waxy buds and because of the numerous stamens look fuzzy and are too crowded to be attractive. They measure about 5½ inches and grow at the tips of branches above the foliage. The fruits ripen early in September and are orange the same color but of different texture than the foliage where the orange is luminous, in October. *Sorbus decora* formerly classed as a variety of Americana and very similar, is preferred for the garden because it has larger fruits. In my garden the mountain ash grows on top of a bank and all along the slope are flowers in tones from pale yellow to orange, such as hermocallis, hypericums and St. Bruno's lily and they make a stunning picture with the autumn fruits and foliage.

These ten small trees are only a few of the many available for gardens and capable of making attractive pictures to frame the suburban or country home.

Name	*Time of Bloom in New York*	*Color of Flowers*	*Autumn Color*	*Color of Fruits*
Dogwood	early May	white	carmine	red
Red bud	early May	purple	yellow	yellow-green
Silver-bell tree	early May	white	yellow	green
Bechtel's Crab	late May	pink	yellow	none
Fringe-tree	May-July	cream-white	yellow	
Franklinia	late May	cream-white		dark red
Sweet Bay	August-October	cream-white	crimson	
Stewartia	July-August	cream-white	dark red	
Hawthorn	mid May	white	scarlet-orange	blood-red
Mountain Ash	late May	white	orange	orange

The Beach Plum, Its Written Record

GEORGE GRAVES

The beach plum, *Prunus maritima,* was among the first of the native fruits noted by Europeans visiting the middle and northern sections of what is now the United States. It had to be, because a landing party coming ashore anywhere between southern New Jersey and northern Massachusetts would most likely have had to pass among the beach plums. The plant inhabits sandy or gravelly wastes so close to salt water that its associates are typical plants of the dune areas just above or behind the Atlantic beaches.

Farther inland grew other species of plums—*Prunus americana, P. augustifolia* and others—which eventually were put to greater usefulness among fruit culturists than was *P. maritima,* as yet relatively unexploited. Much was made of these American plums in the reports of early voyagers, but of these references probably only a few had to do with *Prunus maritima,* if with true plums at all. L. H. Bailey has pointed out that one of the three sorts of "plumbs" ("Putchamins") reported by Captain John Smith and later by Strachey ("pessemmins") was undoubtedly the persimmon. An appraisal of such other old reports as those by Bradford and Winslow, Jacques Cartier, Francis Higginson, Thomas Morton, William Wood and Alexander Young can be found in the introductory chapter to Manning's "History of the Massachusetts Horticultural Society" and in Bailey's "The Evolution of our Native Fruits." (35) (5)

One of the earliest of all records of American plums apparently did refer to the beach plum. W. F. Wight stated that:

> European interest in the matter probably begins with the visit of John de Verrazano, a Florentine voyager, who sailed from the vicinity of Madeira on January 17, 1524, under orders from the French king, Francis I. He is reported to have reached America at about latitude 34° north, and proceeded northward along the coast to latitude 50°, when he departed for France. The explorer's account of his voyage is dated at Dieppe, July 8, 1924, and in his enumeration of American products observed at about 41° north, or the latitude of southern New York, he states: "We found Pomi appii, damson trees and nut trees." The voyagers apparently nowhere went far inland, and the "damson trees" were with little doubt *Prunus maritima,* since this is the only species in that region having foliage at all comparable with that of the damson plum. The fruit could not have been much more than formed at the time and, in fact, no mention was made of it. (22) (64)

Another much-quoted early account is that of Henry Hudson—taken, perhaps, from De Laet's "Nieuwe Werelt," since Hudson's Journal has been lost. The story is that upon entering his namesake river on September, 1609, Hudson is reported to have found "a good harbor, abundance of blue plums, some currants brought by the natives dried and the country full of great and tall oaks." U. P. Hedrick states the opinion that Hudson's "blue plum" was *Prunus maritima.* (25) A number of the other early references to plums are often associated with the beach plum; references which Bailey had earlier shown not to be easily or accurately so referred, particularly the white plum mentioned by Winslow. (5)

However, it is probably safe to assume, for reasons stated above, that some of the plums reported from the Cape Cod area were beach plums.

The modern history of the beach plum did not begin until Revolutionary times. In fact, it was long supposed that the name *"Prunus maritima"* was bestowed as a by-product of the war for independence in that a Hessian mercenary named F. W. J. von Wangenheim became acquainted with the plant on Long Island, N. Y., and published the present name and a description of the beach plum after his return to Germany. Von Wangenheim had two publications, one dated 1781 and the other 1787. For years it was supposed that *Prunus maritima* appeared in the first but it was finally discovered that this assumption was untrue and that von Wangenheim did not name and describe *Prunus maritima* until the latter date. (60) (61) This belated determination of exact publication date was important because Humphrey Marshall had independently named and described *Prunus maritima* in 1785. (36)

In his "Arbustum Americanum," Marshall described the "Sea Side Plumb" as follows:

> This grows naturally towards the sea coast, rising to the height of eight or ten feet, often leaning, and spreading into many branches. The leaves are oblong, rather smaller and not so pointed as those of the common plumb; smooth and of a shining green on the upper side, but something lighter underneath, and slightly sawed on the edges. This is generally well filled with flowers, a few of which are succeeded by small roundish fruit.

Thus, Marshall may be considered the author of a specific name which is most apt in that it associates the plant with its natural environment and makes no reference to the extreme variability shown by *Prunus maritima*. However, Marshall did not overlook this variability and evidently did not understand it because on the same page of his "Arbustum Americanum," he described a "Dwarf Plumb" under the name of *"Prunus declinata"* as follows:

> This is of a small dwarfiish growth, seldom rising above four or five feet high, but frequently bearing fruit at the height of two or three: which is small, almost black when ripe.

This "Dwarf Plumb" of Marshall's is considered by modern botanists to have been a low-growing form of *Prunus maritima*. Thus, with almost the same flourish of the pen, Marshall set down something sound and useful and also started to break up his creation into the bits and pieces which confused botanists for the following half century or so.

Marshall was not the only plant taxonomist who gave separate names to different variants of beach plum. The great French agent and plant explorer, André Michaux, also picked out two forms from different stations and described them as separate species in the same publication. (37) The famous German botanist, Willdenow, described *Prunus pygmaea* in 1796—evidently from a plant grown from a seed taken home by von Wangenheim—and, years later described *P. sphaerica*, seemingly by splitting it off from *P. sphaerocarpa* of Michaux. This last name really belonged to a West Indian species, now known as *Prunus myrtifolia*. However, the colored plate of *Prunus sphaerica* published in Germany in 1825 by Guimpel, Otto and Hayne was apparently the first printed illustration of the beach plum. (21)

And, so it went, different botanists worked independently with specimens collected at widely separated points or taken from plants growing in gardens and set down their own ideas. A review of the names, other than Marshall's, bestowed upon *Prunus maritima* or fragments thereof appears as follows:

Prunus declinata,	Marshall,	1785	(36)
" *maritima,*	Wangenheim,	1787	(61)
" *pygmaea,*	Willdenow,	1796	(65)
" *sphaerocarpa,*	A. Michaux,	1803	(37)
" *acuminata,*	A. Michaux,	1803	(37)
" *sphaerica,*	Willdenow,	1811	(66)
" *pubescens,*	Pursh,	1814	(46)
" *pubescens,*	Poiret,	1816	(43) (54)
" *littoralis,*	Bigelow,	1824	(7)
" *reclinata,*	Bosc ex. Spach,	1834	(52)
" *pubigera,*	Steudel,	1841	(54)
" *Poiretiana,*	Heynbold,	1846	(26)

In addition, Loiseleur-Deslongchamps tried to make a cherry out of Willdenow's *Prunus pygmaea* as did Seringe with Pursh's *P. pubescens* by putting them in the now discarded genus *Cerasus.* (31) (50)

As if this list of synonyms was not long enough, an occasional modern author has tried to add to it, as for instance N. L. Britton's, so listing the name of *Prunus cerasifera* of Ehrhart, now known as the cherry plum. (8) Pursh listed *Prunus maritima* but his description under that name applies to *P. americana* thus causing Bigelow—who apparently had not read Marshall—to be misled into giving the plant a name of his own devising. (7) Elliott had earlier noted this same error on the part of Pursh. (15) (58) Later editions of Amos Eaton's "Manual of Botany for North America" credit the name *Prunus maritima* to Michaux as well as point out that Pursh "copied in the *P. acuminata* of Mx. as a synonym." (14a)

Bigelow's name, *Prunus littoralis,* was ruled out for reasons of priority but his handling of the subject indicates that he had an accurate conception of the species as a whole. He treated variants as forms and described three such "varieties"—(a) fruit an inch in diameter, with glaucous bloom, (b) fruit similar but smaller and (c) fruit crimson, shining.

What is more, Bigelow's three forms seem to have been in cultivation, thus marking the beginning of the division between beach plum botany, and interest in selecting and developing the plant as an orchard fruit. William Robert Prince stated in his "Pomological Manual," published in 1832, that:

> Gen. Dearborn, the enlightened and distinguished President of the Massachusetts Horticultural Society, has himself discovered several varieties of it growing in the wild state, two of which are purple but vary in respect to size, and a third of a shining crimson color; and it is to his liberality that I am indebted for the trees in my collection. (45)

It would appear, therefore, that Dr. Bigelow put on record selections made by General Henry A. S. Dearborn with whom he later was to be active in the founding of the Massachusetts Horticultural Society and through it Mount Auburn cemetery and experimental gardens at the edge of Cambridge.

As far as accurate paper record goes, the honor of first cultivating beach plums rests with the Europeans in that von Wangenheim had taken viable seeds home to Germany in the late 18th century and J. C. Loudon reported that *Prunus maritima* was introduced into Britain in 1818. (64) (32) However, Bigelow and his friends apparently started the current interest in selecting beach plums for fruiting purposes. Even so, the nursery catalogues of William Prince of the time list beach plums

purely as ornamental plants under a collection of synonymous names such as *Prunus maritima, P. pubescens, P. littoralis, P. pygmaea, P. sphaerocarpa* and *P. sphaerica.* (44)

Interest in the beach plum for the sake of decorative quality during the fortnight of its blooming period has long been high. Even though few plants are sold for fruit production, there is now, as in years past, a demand for beach plums for purely ornamental planting. The reason for this demand can be easily understood when it is recalled that in 1932, two Arnold Arboretum botanists were able to plot the local distribution of *Prunus maritima* by flying over Massachusetts coastal areas during the flowering season, so noticeable is the plant when in bloom. (3)

In 1840, Torrey and Gray worked over beach plum botany up to that date and divided the species into two varieties. Under the first (α) with leaves softly pubescent or tomentose beneath, fruit large, pleasant, they listed *P. maritima* of von Wangenheim (Marshall was still overlooked as explained above), *P. sphaerocarpa* of Michaux, *P. pubescens* of Pursh, *P. littoralis* of Bigelow and *Cerasus pubescens* of Seringe. Under the second (β) with leaves mostly glabrous on both sides when old, fruit smaller, red or purplish, they gathered *Prunus pygmaea* of Willdenow, *P. declinata* of Marshall, *P. acuminata* of Michaux and *Cerasus pygmaea* of Loiseleur-Deslongchamps. Torrey and Gray commented as follows:

> The two forms here described may be traced into each other with great certainty; and Bigelow seems to have included both under his *P. littoralis.* The fruit of our β is sometimes scarcely half an inch in diameter, and often pretty well flavoured; but it is only on a warm sandy beach that it arrives to perfection. (58)

This "lumping" indicated that the wide range of variability in plant habit, foliage and fruit displayed by the beach plum was becoming understood, and that what had formerly been looked upon as separate species are actually different expressions of an entity—*Prunus maritima.* Subsequent study has followed along this line by mapping the natural range over which the beach plum could be expected to be found growing and by study of variation both local and geographical.

Modern botanists list the range of *Prunus maritima* as being from New Brunswick south along the Atlantic coast and coastal islands to Virginia or the Carolinas, with the greatest development occurring between northern Massachusetts and southern New Jersey. Typical *Prunus maritima* is represented in the Gray Herbarium of Harvard University by specimens collected from Maine to Delaware.

Two types of variation are involved. First there are the numerous forms to be found on common areas in the centers of dense population of the plant and which cannot be expected to come true from seed. There is also variation due to long isolation and subsequent natural selection.

The beach plum occasionally is found in isolated, somewhat inland spots such as those noted by Witmer Stone in interior New Jersey. (55) John Y. Pennypacker and others have explained these inland stations as being stranded patches left behind long since as the ocean slowly retreated eastward. Dr. Pennypacker observed that the New Jersey pine barren colonies differ from anything found along the coast, being populated only by plants which bloom relatively early and bear uniformly small blue fruits. (41) This checks with the statement by William Darlington that "When growing at a distance from the sea, its leaves are smoother and thinner and its fruit smaller, forms

which have been considered as distinct varieties or even species." (11) This observation of Darlington's was repeated in the sixth edition of Gray's "Manual of Botany" and by U. P. Hedrick in his "Plums of New York."

The property of early flowering or earlier ripening of plants back from the shore on higher, heavier ground is a matter of hearsay in numerous coastal areas. Such natural plantings are found running inland for miles on suitable soil areas in New England, sometimes along streams such as the Merrimac River. Very often, slightly inland hedgerow stations have no significance to the student of plant distribution. Local Floras credit Indians, birds and "stones thrown by farmers on their way home from haying on the marshes" for inshore beach plum plants or thickets. As for birds, William Van Dersal reports stomach records from starlings only. (48) (59)

Another matter of everyday assumption is that plants moved from sandy shore conditions to heavier, well drained soil will grow more vigorously than before. Actually, the detailed influence on the individual plant of such a change in environment has yet to be carefully checked.

One interesting attempt to explain the kind of location where a wild plum can persist was put forward by Roland H. Harper, who suggested that: "*P. maritima* prefers sandy and rocky shores where the vegetation is too sparse to carry fire and the water affords protection on one side." (24) Thus, a plant may not always be found where it will grow best but, instead, where it can best survive.

Two stations far distant from the Atlantic Coast have been reported and argued over. Higley and Raddin, two botanists in the Chicago area, reported finding one or two specimens of the beach plum at Winnetka, Illinois, in 1882, and later in sandy soil at other points at the south end of Lake Michigan. (27) Their claim was not beyond serious consideration since other plants are known to have a somewhat similar natural distribution. Wight, however, stated that: "Most of the specimens cited by Higley and Raddin are in the Herbarium of Northwestern University, and all of these are found to be *P. pumila,*" an inland species. Wight also explored a considerable portion of the region about the head of Lake Michigan and found no trace of *Prunus maritima*. (64) In 1927, H. S. Pepoon in his "Flora of the Chicago Area" recorded that no recent collector had been able to find the beach plum in Evanston and vicinity. (42) The last word on this supposed presence of *Prunus maritima* in the Lake Michigan area seems to belong to Ernest L. Palmer, who in 1934 visited Lake County, Michigan, to examine in the field, wild plum plants from which James E. Armstrong had sent specimens to the Arnold Arboretum two years before. Mr. Palmer found what he states to be without doubt *Prunus maritima,* growing in openings in sandy, upland woods a mile or two south of Walhalla, a town twenty or twenty-five miles east of Lake Michigan. (40)

Another long discussion revolved around the southern extensions of the range of the beach plum. In 1897, A. W. Chapman listed *Prunus maritima* among the plants of Alabama; associating his plum with the name of Buckley, a collector who had been referred to by Torrey and Gray in 1840. (10) The possibility that the Buckley specimen could be beach plum had been disposed of five years before by C. S. Sargent in his "Silva of North America." (49) Dr. Sargent wrote:

> There is preserved in the Herbarium of Columbia College a specimen of Prunus collected in Alabama many years ago by Mr. S. B. Buckley and referred by Torrey and

Gray (Fl. N. Am.; 408) to their variety β of *Prunus maritima*, and in the same collection a specimen of what is described as "a small tree ten to fifteen feet high; fruit oval, small, blue, glaucus, very austere to taste" and which was seen many years ago in Lincoln County, North Carolina, by Mr. M. A. Curtis, who mentions it in his report of the trees of that state (Rep. Geolog. Surv. N. Car., 1860, iii 56). It is possible, as Professor Britton is inclined to believe, that these specimens represent a southern form of *Prunus alleghanensis;* but they are without flowers and hardly suffice to justify the extension of the range of the species of which no other trace has been found in the now well-explored region of the southern Alleghany Mountains.

The listing of the beach plum as an Alabama plant was also disputed from another angle in 1899, by Charles Mohr whose discussion of *Prunus hortulana* includes the statement that: "*Prunus maritima* in Chapman's Flora S. States Ed. 3 *Alabama Buckley*, most probably belongs here." (38)

As for instances of the supposed presence of the beach plum in Louisiana, Dr. Pennypacker quotes Professor R. S. Cocks of Tulane University as having no evidence of the plant growing in that state. However, Pennypacker cited a specimen in the Herbarium of the Academy of Natural Sciences in Philadelphia, collected along the sandy shores of Texas about 1865, which he said appeared to resemble *Prunus maritima* in some characters and appeared to be related. (41)

Another suggestion of a link with the south was made in 1899 by Frank A. Waugh, who studied all available herbarium sheets of *Prunus maritima* and sorted the specimens into five groups on the basis of size, shape and degree of hairiness of the leaves. Since Prof. Waugh made no measurements and did not relate his leaf groups to fruit characters, growth aspects or points of collection, his work contributed little beyond proving that the study of beach plum variations must be carried on in the field, as well as in the herbarium. However, like Dr. Pennypacker, Prof. Waugh found a southern resemblance in one specimen and about which he wrote:

A specially interesting specimen of this [his type No. 3, with taper-pointed leaves] collected at Tottenville, Staten Island, in 1897 by A. A. Tyler, is in the National Herbarium. This specimen is indistinguishable from Sargent's specimens of *Prunus injucunda* Small, collected at the base of Stone Mt., Georgia. In fact all the material of *P. injucunda* examined, including Dr. Small's co-types and the specimens of Earle and Baker (Alabama Biological Survey Nos. 1573 and 1574), seems to be easily referable to this type of *P. maritima*. (62)

A more certain beach plum relative is *Prunus Gravesii*, named for Dr. Charles B. Graves, who found it growing near more ordinary beach plums on a cross-shaped area, on a low, gravelly ridge near Long Island Sound, at Groton, Connecticut. In 1897, Dr. John K. Small found enough difference in all characters to name and describe the plants in this small area as a separate species. (51)

The latter part of the nineteenth century also saw a start made towards the economic development of the beach plum, in some ways a false start or, at least, an abortive one. In November 1872, the *American Agriculturist* published what is thought to be the first American illustration of *Prunus maritima* together with an unsigned article in which the author pointed out that: "The plant has been described by botanists under a half a dozen or more different names." He continued:

The fruit varies in different plants, not only in color and size, but in quality—some specimens being quite pleasant to the taste, and others harsh and acerb. It is highly prized by those who live near the shore for making preserves, and it is often seen offered for sale in the markets of seaport towns. (2)

The local importance of beach plums as fruit for home processing had been mentioned by George B. Emerson (16) and other authors, and it is not surprising to find records of attempts at culti-

vation through the selection, propagation and distribution of forms with outstanding fruiting properties. The first such clone seems to have been introduced in 1872 and soon became known as "Bassett's American," later shortened to "Bassett." The original plant had been bought by William F. Bassett of Hammonton, N. J., from a man who had found it in the neighborhood. It is said to have had dull red fruit, about three-fourths of an inch in diameter and of "poor quality." (4) Its record seems to prove that *Prunus maritima* will grow well in most parts of the country.

Bassett's American was evidently propagated and sold through A. Hance & Son of the Rumsom Nurseries and later through J. T. Lovett of Little Silver, New Jersey. Prof. Budd spoke well of its performance at Ames, Iowa, and Stark's Nurseries of Louisiana, Missouri, offered it as curculio-proof and as superior to the cranberry for dessert purposes. (19) Bassett's American seems, however, to have disappeared from seaboard commerce by about 1885 in favor of Wild Goose (*Prunus Munsoniana*), although it was reported to have fruited at the Ohio Experiment Station as late as 1904. (39) Lovett apparently offered the plant only for the sake of its fruit. His catalogues of that period make no mention of the beach plum as an ornamental plant. (33)

In 1899, E. M. Winsor took a purple-fruited selection from the wild in New Jersey, named it "Alpha" and had it introduced to the trade by J. M. Kerr of Denton, Md. About the same time, Mr. Winsor introduced a yellow-fruited selection under the name of "Beta." (39) (25) These, like Bassett's selection, lost out when grown in inland orchards in competition with varieties derived from other species.

In cultivation, these selected forms were increased by being grafted on understocks of other species. On the other hand, no lasting effort seems to have been made to follow out the suggestion of the *American Agriculturist* author that *Prunus maritima* be tried as a possible dwarfing understock for cultivated plums. However, Hans J. Koehler of Marlborough, Mass., tells of his recollection of such employment of the wild root by the late Jackson Dawson of the Arnold Arboretum. However, no written record of any such work on Mr. Dawson's part now exists.

Meanwhile the idea of crossing the beach plum with other species was, and still is, the starting point in the minds of many interested in "improving" this native fruit. Luther Burbank was active at that time and claimed to have grown beach plum seedlings by the hundred thousand and to have selected forms with fruits nearly an inch in diameter, of pleasing form and color. His dream, so he wrote, was to make use of the great hardiness, late-blooming, enormous productiveness and ruggedness of *Prunus maritima* in his plant breeding program. No accurate record of Burbank's crosses seems to exist but apparently, starting in 1887 and continuing for 20 years or so, he mixed beach plums with hybrids of American and Japanese origin and came out with three named varieties and a host of untested seedlings.

Burbank's "Giant Maritima" was a second generation hybrid from an "improved" beach plum pollenized by one of the hybrid Japanese plums. At its fifth year of bearing, some of its deep crimson fruits were reported to have measured eight and a quarter inches in circumference but were of little commercial value, as they locked firmness of texture. A second Burbank hybrid named "East" was a prolific bearer of pale yellow fruits inferior in quality to the best hybrid Japanese plums. The

deep red fruits of a third Burbank production named "Pride" also lacked shipping quality. (9)

None of these three Burbank hybrids of *Prunus maritima* seems to be included in the latest Standardized Plant Names list of plum varieties. A Burbank variety named "Giant" is credited to *Prunus domestica*. "East" is not mentioned. "Pride" is referred to "Sheldrake," a seedling of *Prunus domestica* introduced by J. Hunt in 1895. (29) Luther B. Hall stated in 1939 that at least three more beach plum hybrids were tested after Mr. Burbank's death and found worthy of preservation. (23) The present whereabouts of these three clones is undetermined, if they still exist.

A more authentic and much less spectacularly reported beach plum hybrid has been named *Prunus Dunbarii* by Alfred Rehder. This hybrid originated about 1899 from seed of *P. maritima* collected by John Dunbar in Highland Park, Rochester, N. Y. There is no doubt, Mr. Rehder states, that the other parent was *P. americana*, a plant of which was standing near the seed parent, as it is clearly intermediate between the two. *Prunus Dunbarii* has purple fruits larger than those of *P. maritima* and with larger, more compressed stones. As an ornamental plant, this hybrid seems to surpass when in bloom both of its parents in beauty. (47)

The most thorough-going studies of the variation of the beach plum in the centers of its natural coastal range in New Jersey and New England were made by J. M. Macfarlane and one of his students at the University of Pennsylvania, John Y. Pennypacker. (34) (41) In fact, the latter earned the degree of Doctor of Philosophy for his observations and analyses of the different forms of *Prunus maritima*. Professor Macfarlane, who reported on eight years of field study of the plant in 1901, was probably the first to attempt an explanation of the relationships among the numerous forms. His observations were confined almost entirely to fruit variations from plant to plant. He cited Wood as having already established that there is great uniformity in every respect among the fruits on an individual plant, the greatest difference, though a slight one, being that of size.

Professor Macfarlane determined that the important points of variation displayed by the fruits of different beach plum plants are (a) color, (b) weight, (c) size and shape, (d) consistence, (3) taste, (f) time of ripening and (g) comparison of stones.

His first observation was that blue-black is the preponderant fruit color and reasoned that:

> This seems to be the color which by natural selection, becomes dominant in the localities I have visited, though it is not to be regarded as the primitive type. From more primitive forms than this, three diverging lines of variation seem to be traceable, one gradually receding to more and more primitive types, a second advancing to the more highly specialized forms that end in the yellow-fruited examples. The former is made up of the types which pass in color from black-blue to bluish, bluish purple, green purple and finally purplish green. The last of these seems, for many reasons, to be the primitive form. Along the second line successive steps can be taken through bluish purple, purplish red, and reddish yellow, till a pure orange or gamboge yellow is reached, which in tint will compare with the finest cultivated plums of the Golden Esperon section. Some of the reddish yellow and yellow types are flecked with faint white specks or blotches, while others are quite uniform. The third line culminates in the finest blue-blacks.
>
> The surface variations thus shown usually are an index to corresponding variations in color of the pulp. In the blackish blues, this is a dull reddish purple hue; in the bluish purples of a pale greenish red; in the purplish greens of a light watery green, while in the red-yellow series it passes from shades of pale watery red to watery yellow.
>
> The color variations of the stones follow those of the fruits though to a less marked degree. The stones of the black-blue fruits are of a purplish red hue when fresh, changing to dull red when dried. Those of the purplish-red fruits are of a faint red or reddish yellow hue; of the red fruits the stones

are faint yellow. Finally the yellow fruits have clean whitish-yellow stones.

Dr. Pennypacker considered this same problem of difference in fruit coloration and in his publication of 1919 states conclusions indicating that in his opinion the order of development of color is somewhat different from that suggested by Professor Macfarlane. He reported that:

> The majority of the fruits in any one locality are of the dark blue variety, and comprise about 75 percent of all the plants. The yellow is the least common and forms about 1 percent, the reds about 5 percent and the purples not over 20 perecent.
>
> The red, purple, and blue colors seem to be due to one or more pigments added to the yellow color. This became apparent when I added a dilute solution of NaOH to the skin of the red variety. The red dissolved pigment was readily attacked by the alkali and quickly changed its color to purple, to green and finally to yellow. Small yellow chromatophores were easily distinguished after the disappearance of the dissolved pigment, and the pulp, which was treated in a similar manner, though containing only a small amount of pigment, had the same general appearance as the yellow variety. This seems to prove, as far as color goes, that the yellow is the more primitive type and that the red has taken on an added pigment. In the purple and in the blue varieties there appears a subepidermal layer which in addition to the red dissolved pigment (same as in the red varieties) gives to the fruit their respective colors. This pigment is contained in small oval or rod shaped bodies which are considerably smaller than the cells which contain the red dissolved pigment. The skin of the purple and of the blue varieties resembles the skin of the red after the inner pigmented layer has been removed. This further emphasizes the fact that the yellow is the more primitive type, since the purples and the blues have evolved from the reds by the increasing alkalinity of a dissolved red pigment, and again the reds have evolved from the yellows by the formation of a dissolved acid pigment, and the disappearance of the yellow color from the chromatophore.

Professor Macfarlane divided wild fruits into 12 groups on the basis of color and made careful studies of fruit weights, working out the ratio between weight of pulp and that of stone in each case. His table is not repeated here because, essentially, the same findings were made by Dr. Pennypacker and are included in the diagnostic table of his varieties.

Doctor Pennypacker reduced Macfarlane's 12 groups to eight major variants or "varieties" and two exceptional forms, the small, early-fruiting, inland blue and a very late-fruiting, Small Purple. Like Macfarlane before him, he chose to separate on the basis of color distinction and thus had Large Blue, Small Blue, Large Purple, Small Purple, Large Red, Small Red, Large Yellow, and Small Yellow. Beyond that, he proposed to translate these English names into Latin, making them *Prunus maritima,* var. *coerulea magna, P. m.* var. *coerulea parva,* and so on. The small inland blue-fruited variety, was to be called *P. m.* var. *praecox.* No other botanist seems to have taken up this idea. Nor could he, in the case of the yellow, because it had been named *P. m.* forma *flava* by G. S. Torrey in 1914, with the remark that it seemed desirable as a matter of convenience to recognize as a form so conspicuous a variation. (57) Pennypacker's deduction that yellow fruit in beach plum may be primitive had yet to be made.

At the suggestion of Professor Macfarlane, Dr. Pennypacker set out to discover variations in beach plum plants other than that displayed by the fruits and, if possible, to plot any correlations existing among them. Starting with his four color selections, each in two fruit sizes, he made careful studies of plants bearing each type of fruit as regards such characters as form of plant, bark, lenticels, buds, leaf scars, leaves and flowers. The result was the conclusion that the plants bearing each of the eight fruit types had a sufficient number of definite characters by which they could be classed as constant "varieties," in spite of the fact that intermediate forms among the eight extremes of variation are frequent. The following table has

DIAGNOSIS OF PRINCIPAL VARIANTS OF *PRUNUS MARITIMA* IN SOUTHERN

	Leaves				*Flowers*				
Variety	*Size*	*Length of petiole*	*Pubescence*		*Blooming Period*	*Width of flower*	*Length of pedicel*	*No. and Length of Stamens*	*Length of style*
			Upper Surface	*Lower Surface*					
Large Blue	3.5x6.8 cm	1.0 cm	Pubescent along midrib and leading veins	Pubescent only along midrib	May 1-15	1.5-2.0 cm	1.5 cm	35, 8-12 mm	1.5 cm
Small Blue (shore)	3.0x5.7 cm	1.0 cm	Pubescent only along midrib	Pubescent only along midrib	May 1-15	1.4-1.8 cm	1.3 cm	35, 8-10 mm	1.2 cm
Small Blue (inland)	2.5x5.5 cm	.7 cm	Pubescent along midrib, veins and cross veins	Very pubescent as described for upper surface	April 20-May 5	1.0-1.5 cm	1.0 cm	25, 5-10 mm	1.2 cm
Large Purple	3.5x6.8 cm	1.2 cm	Pubescent only along midrib	Pubescent only along midrib	May 1-15	1.5-2.0 cm	1.5 cm	30, 8-12 mm	2.0 cm
Small Purple	2.0x4.0 cm	1.0 cm	Pubescent only along midrib	Pubescent only along midrib	May 1-15	1.0-1.5 cm	1.5 cm	30, 5-10 mm	1.0 cm
Small Purple (late)									
Large Red	3.2x6.8 cm	1.1 cm	Pubescent only along midrib	Pubescent only along midrib	May 1-15	1.5-2.0 cm	1.0 cm	30, 8-12 mm	1.5 cm
Small Red	2.0x4.5 cm	.9 cm	Pubescent only along midrib	Pubescent only along midrib	May 1-15	1.0-1.5 cm	1.5 cm	30, 5-10 mm	1.0 cm
Large Yellow	3.5x6.8 cm	.8 cm	Pubescent along midrib, slightly along leading veins	Pubescent only along midrib	May 1-15	1.5-2.0 cm	1.5 cm	30, 8-12 mm	1.5 cm
Small Yellow	2.5x5.7 cm	1.0 cm	Pubescent over whole surface, midrib, veins and cross veins	Pubescent along midrib, veins and cross veins	May 1-15	1.0-1.5 cm	2.0 cm	30, 5-10 mm	1.0 cm

been compiled from Dr. Pennypacker's observations of the leaves, flowers and fruits of his fruit color groups. A study of this table will reveal that "improvements" such as those reported by Burbank could result from selection.

Professor Macfarlane had also noted that the taste of beach plum fruits is determined largely by the presence or absence of sugar, tannin, and acid constituents. Wide variations, he stated, occur in the relative quantity of these. Dr. Pennypacker later brought out that the tannin which gives the fruits their bitter astringent taste is deposited in a layer beneath the skin. He found the yellow fruit to be free of it, while the late-maturing kinds contain the most, the Small Purple being extremely bitter. The softer and larger varieties when ripe contain only small traces of tannin.

The first publication of a careful chemical analysis of beach plum fruits seems to have been that of S. G. Davis and A. S. Levine of the Massachusetts Agricultural Experiment Station. (12) In August 1942, these authors reported in the "Fruit Products Journal" that they had prepared a quantity of beach plums for analysis at various stages of maturity by dividing representative portions of the fruit on the basis of color. Presumably they worked with samples which included only fruits which were bloomy, bluish-black at maturity. After sorting the fruit, they pitted it and dried it in a current of warm air prior to analysis. The cleaned pits constituted approximately 15 percent of the total weight of fresh fruits, a figure slightly higher than that given by Pennypacker for sizable fruits.

The results of a proximate analysis of the edible portion by Philip H. Smith, following the methods of the Association of Official Agricultural Chemists, is given in their table as follows:

NEW JERSEY, AS ADAPTED FROM DATA COLLECTED BY JOHN Y. PENNYPACKER

		Fruits						
Period of Ripening	*Shape of Fruit*	*Dimensions of Fruit*	*Average Weight*	*Average weight of stone*	*Percent Flesh*	*Length of stone*	*Thickness of stone*	*Remarks*
Aug. 5-25	Spherical or flattened at blossom end	1.7x1.6 cm	3.61 grams	.54 grams	88	12.5 mm	11.0x7.3 mm	Flesh watery green, pulp free from stone, sweet and pleasant taste
August 10-30	Sub-globose to oval	1.5x1.4 cm	1.74 grams	.22 grams	87	11.0 mm	7.5x5.8 mm	Flesh watery green, pulp free from stone, sweet and pleasant
August 1-20	Spherical or slightly flattened	1.2x1.3 cm	1.29 grams	.18 grams	86	7.8 mm	6.5x5.4 mm	Flesh watery green, pulp free from stone, sweet and pleasant
Aug. 15-Sept. 5	Spherical to slightly oval	1.7x1.6 cm	3.52 grams	.43 grams	86.5	13.5 mm	10.0x6.5 mm	Flesh watery greenish yellow, pulp decidedly free from stone, sweet and pleasant
Sept. 1-Oct. 1	Spherical or slightly oval	1.3x1.2 cm	1.40 grams	.22 grams	84	8.5 mm	7.8x5.5 mm	Flesh watery greenish yellow, pulp free from stone
		.9x1.0 cm	.55 grams	.18 grams	67			Pulp tending to cling to stone, bitter astringent taste
Aug. 25-Sept. 15	Spherical or slightly flattened	1.6x1.5 cm	2.82 grams	.40 grams	86	12.5 mm	9.5x6.5 mm	Flesh watery reddish yellow, pulp free from stone, taste sweet
Aug. 25-Sept. 15	Spherical or slightly flattened	1.4x1.3 cm	1.71 grams	.28 grams	84	9.0 mm	8.5x5.8 mm	Flesh watery reddish yellow, pulp free from stone, sweet
Aug. 10-30	Spherical or slightly flattened	1.7x1.6 cm	2.92 grams	.40 grams	86	10.0 mm	9.5x7.5 mm	Flesh watery yellow, pulp decidedly free from stone, sweet
Aug. 10-30	Spherical or slightly flattened	1.4x1.3 cm	1.70 grams	.22 grams	87	8.5 mm	7.0x6.0 mm	Flesh watery yellow, pulp decidedly free from stone, sweet

TABLE 1. PROXIMATE COMPOSITION OF THE BEACH PLUM*

Sample		*Moisture Percent*	*Protein (Nx6.25) Percent*	*Ether Extract Percent*	*Extract Matter (Sugars) Percent*	*Fiber Percent*	*Ash Percent*
Immature Fruit	Moisture free basis	0.0	3.09	1.95	85.40	5.73	3.83
	Fresh basis	86.6	0.41	0.26	11.45	0.77	0.51
Partially Mature Fruit	Moisture free basis	0.0	2.70	1.61	87.10	4.89	3.70
	Fresh basis	86.6	0.36	0.22	11.67	0.65	0.50
Mature Fruit	Moisture free basis	0.0	2.74	1.83	87.12	5.15	3.16
	Fresh basis	86.6	0.37	0.25	11.68	0.69	0.41

*The analysis was made on dried fruit.

The same authors had the following to say about the vitamin content of beach plums.

Vitamin A was determined as carotene (pro-vitamin A) according to the method of the A.O.A.C. (1940). Since carotene is affected very little by drying, this analysis was made on a dried sample of the fresh, mature fruit. Calculated on the fresh basis, 6 parts per million of carotene were found. This is equivalent to 10 International Units of vitamin A per gram of fresh, mature fruit.

Thiamin (vitamin B1) and riboflavin (vitamin B2 or G) were found in amounts too small to be of significance from a nutritive standpoint. Such small amounts of these vitamins are to be expected since fruits in general are low in the B vitamins.

Vitamin C determinations were of little significance. Any ascorbic acid present in beach plums would be almost entirely oxidized in the manufacture of the fruit into jelly or jam.

Davis and Levine pointed out that the beach plum is high in ash and carbohydrate matter and slightly low in protein as compared with some other kinds of plums. They calculated calorific value to be 50 calories per 100 grains of fresh fruit. They also presented the following data on the amount of pectin present, the pH and other pertinent factors.

pH	3.3	percent
Pectin (as alcohol precipitate)	0.90	percent
Total acidity (as citric acid)	1.23	percent
Soluble solids content of expressed juice	10.25	percent
Reducing sugars	4.60	percent
Tannin and coloring matter	0.69	percent

Since L. W. Tarr of the University of Delaware had previously found that the pH range for jellies is between 2.2 and 3.5, Davis and Levine called attention to the fact that the beach plum is near the upper limit in this respect. They also cite W. V. Cruess, author of a book entitled "Commercial Fruit and Vegetable Products" to prove that the 0.9 percent of pectin present in beach plums is the lower limit at which jellation will occur. As a part of their thorough report on the processing of beach plums into jelly, jam, butter and other suggested products, Davis and Levine include the following:

In the preliminary experiments, jellies were made from the immature, partially mature, and ripe beach plums as well as from a mixture of the fruit representing all stages of maturity. These jellies were examined after storage at room temperature for one week. All of the jellies were weak in structure and somewhat sirupy, and little difference could be noted in the consistency. There was a decided lack of color and characteristic beach plum flavor in the jelly made from the immature fruit. No appreciable difference could be detected in the flavor and color of the jelly made from the mixed fruit when compared with that made from the mature fruit alone. The mixed fruit was used for all later jellies.

During their investigation of all angles of the jelly-making process, Davis and Levine developed the following procedure:

To one pound of washed fruit add one pint of water and boil moderately in a covered vessel for 15 minutes. Strain through one thickness of cheesecloth without pressing. Return the pulps to the kettle, add another pint of water, and extract again for 10 minutes. In straining this time express all the juice. Mix the two extractions, concentrate to one pint, and clarify by straining through four thicknesses of cheesecloth. To the clarified extract add 12 ounces of sugar in which has been mixed 2.7 grams (one level teaspoon) of 100 grade dried citrus pectin, or two ounces (one fourth of a bottle) of Certo. After adding the sugar, concentrate rapidly to a jelly test of 65 to 68 percent soluble solids. The temperature at the finish point is 9-10° F. above the boiling point of water. A yield of 18 ounces of jelly per pound of fruit is obtained by this procedure.

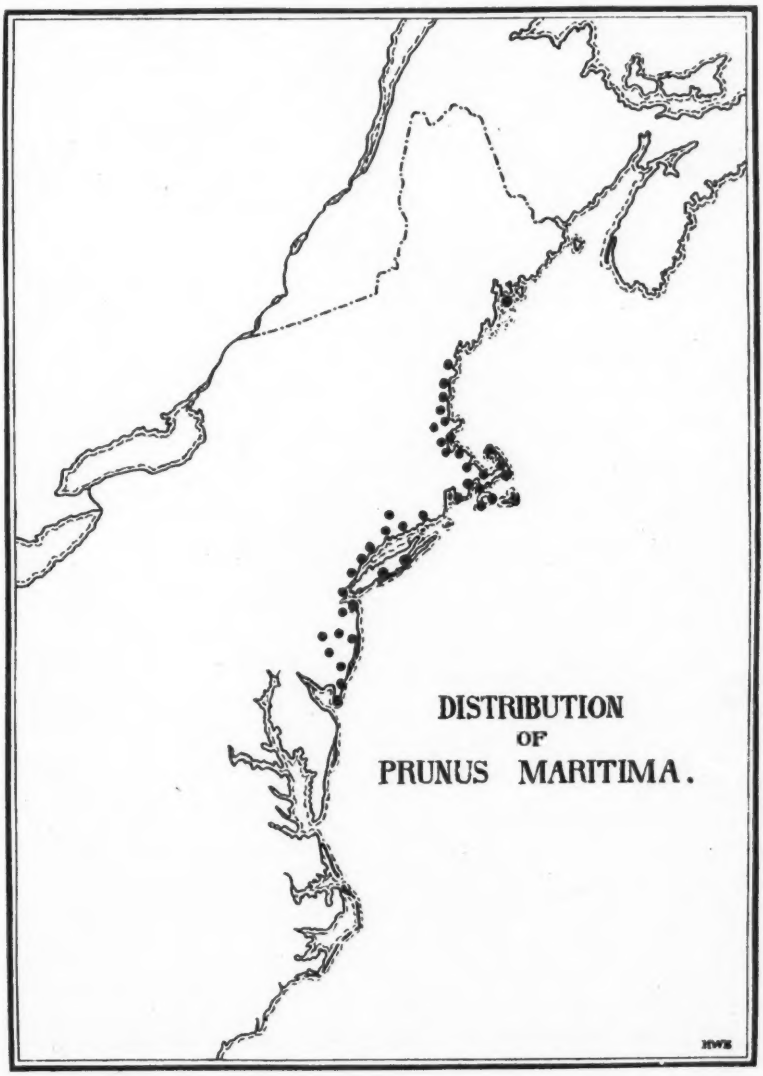
Davis and Levine also worked over the technique of preserving jelly stock during a busy harvest season for processing at leisure later on. Their method of carrying out this procedure—often practiced in home kitchens in seaside communities—was as follows:

Some ripe fruit was extracted according to the regular procedure, concentrated to eight percent soluble solids as when making jelly, and packed in two-quart Mason jars. The jars were pasteurized at 180 F. for 30 minutes and, after cooling, were stored. Jellies made from this extract after four months storage at either 40 or 70 F. were equal in every respect to those made from the fresh fruit. Apparently this pasteurizing process is sufficient to destroy any pectinase enzymes. When beach plums are to be used for jelly making, the jelly extract may, therefore, be stored for several months without change in the jelling properties, flavor, or color of the finished product.

Commercial processors in some areas keep beach plums for later processing by quick-freezing the fruit and holding it at a storage temperature of zero or slightly below, apparently without prior blanching for purposes of enzyme destruction. Future research may prove blanching advisable.

The need for some such storage method arises from more than the mere rush of a single harvesting season. It is a well-known fact that every year does not bring a good crop of beach plums. In fact, the commercial processors plan on a good crop in only one year out of three. Therefore, storage of the unprocessed or partly processed fruits has been felt necessary if any continuity of manufacture and distribution of beach plum products is to take place.

The reasons for frequent poor crop years are not entirely clear, nor are such troubles limited to this one kind



From the Bulletin of Popular Information, The Arnold Arboretum, August 15, 1932

of plum. Dr. Pennypacker, who watched carefully for odd or interesting behavior in beach plums, had this to say about their flowering habits:

> The flowers are apparently proterogynous, since the stigma matures before the flower is fully open and may easily be seen protruding between the petals of a partly opened flower bud, but homogamy is probably not uncommon. The style projects in the middle of the flower beyond the obliquely diverging stamens, and is 10 to 20 mm. long. The ovary is one celled and characterized by two pendulous ovules. Frequently the flowers are andro-dioecious which would account for the profusely abundant blooms matured on every bush during April and May, and also for the total lack of fruits on some bushes, the rarity on others, and the extreme abundance on still others. The last noted would naturally be those that developed stamens and a well formed pistil with swollen ovary and elongated style. At Hainesport, N. J., the writer has observed bushes for three years, during which time they have never set fruit, yet have constantly bloomed in great profusion. The same condition prevails in other localities. The flowers are insect pollinated as is indicated by the vast horde of *Hymenoptera* which frequent them during the warm part of the day. The showy white corolla and the nectary are the chief attractions for insects as the flowers are practically odorless. Cross pollination is favored by most writers, and such a view seems likely from the fact that the bee in order to obtain the nectar must get far into the interior of the flower. In so doing it seems hardly possible for it to miss touching the stigma.
>
> Knuth states that automatic self-pollination appears regularly to take place in hermaphroditic flowers of the *Pruneae* should insect visits fail. Whether this is effective or not seems doubtful, as Kirchner states that numerous bushes observed by him rarely set fruit. The true explanation, however, seems to be found in the andro-dioecism as described above by the writer.

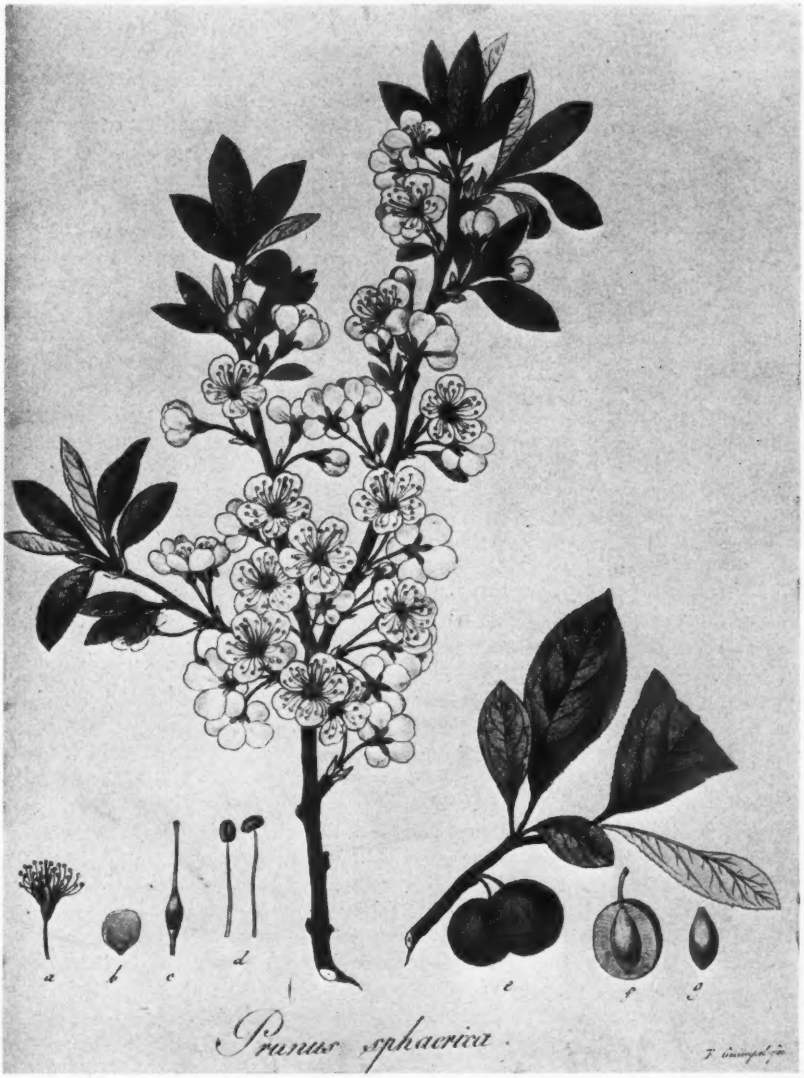
The same author also reported the frequent appearance of abortive stamens. However, while his explanation may hold for permanent differences in fruiting habit among certain plants, it does not account for years of heavy crop and light, or no crop at all, on the same plants.

The most widely held belief as to yield variations has been expressed by Bertram Tomlinson as follows:

> From observations made during the past seven years, it would seem that the crop is seriously affected by adverse weather conditions at flowering time. A cold, wet season apparently causes poor pollination. Then too, killing frosts often destroy much of the crop, and insects and diseases also take their toll. During recent years, very serious damage has been done by the tent caterpillar in early Spring. (56)

Mrs. Wilfred O. White has compared records of temperature and rainfall during late April and May at Vineyard Haven, Mass., for the poor crop year of 1940 and the exceptionally good year of 1941 and her findings tend to bear out Mr. Tomlinson's opinion. The Spring of 1941 was the driest in that area in four years. W. S. Flory and M. H. Tomes have recently reported that *Prunus maritima* in their plantings at the Texas Agricultural Experiment Station bore 93.7 percent normal pollen when checked in 1941. (18) The same authors go on to state that the presence of normal pollen is not enough, it must also have a suitable environment in which to germinate. They quote A. H. Hendrickson of the California Experiment Station and C. L. Becker of the University of Minnesota that pollen germination can be affected by the kind of weather which prevails at flowering time and can be influenced by temperature changes. The orchard problem of presence or absence of suitable pollinating plants would hardly seem to be present in wild areas where under natural conditions some years are good crop years and some are not.

The investigations of Davis and Levine stand as one of the more recent manifestations of the current resurgence of interest in the economic development of the beach plum, believed by many to be long overdue. The time has come, these persons think, to take this wild fruit out of the class of being merely a part of nature's bounty to middle Atlantic seaside dwellers and start processing it on a commercial



The colored plate published in Germany in 1825, by Guimpel, Otto and Hayne, is considered to be the oldest illustration of the beach plum.

scale. The increasing progress made in this direction by a few individuals has determined the presence of sufficient potential demand for beach plum products to warrant planting *Prunus maritima* on a considerable scale, and for itself alone, since its fruit flavor is unmatched by that of any other fruit known to the jellymaker or fruit preserver.

The ideas of hybridization and of "improvement" as suggested by Hugo DeVries (13) and of the employment of over-stimulating cultural practices seem to have faded into the background. The present purpose seems to be that of growing beach plums in a natural state and under the environment which seems most suitable for them. "Improvement" at the moment means selection of the best of the wild types, increasing them by vegetative means and, once planted, protecting them from their enemies. These steps, in themselves, call for trials and research which are now getting under way with promise of carrying beach plum culture to a higher point than those previously reached by Dearborn, Bassett, Kerr and others who grew beach plum selections in past years.

While many people have been recently interested in beach plums, the names of a few individuals stand out. One such is Bertram Tomlinson, a Cape Cod county agricultural agent who has done as much as anyone to assemble information about the plant and its culture and to pass the facts along to the hundreds in his area who have been seeking it. His bulletin, quoted above—probably the only publication on the subject ever issued—appeared first in 1938 and in revised form in 1941.

Another important step towards the encouragement of beach plum exploitation was the setting up of the James R. Jewett prizes in 1940. Doctor Jewett, Professor of Arabic, Emeritus at Harvard University, acquired an interest in the subject as a long-time Summer resident of Cape Cod. Before his death, he invested money in a commercial processing venture and also turned over the sum of five thousand dollars to the Arnold Arboretum, the income from which is to be used for the development of beach plums or other native or introduced fruit-bearing trees and shrubs. Since beach plums were Dr. Jewett's first interest, two prizes are offered annually for the two individuals who, in the opinion of a special committee, have done the most for the exploitation of *Prunus maritima* within the past twelve-month period. The James R. Jewett prize winner is awarded one hundred dollars. The Vieno T. Johnson prize, which carries an award of fifty dollars, commemorates an old employee of Dr. Jewett.

The James R. Jewett prize was won by Mrs. Wilfred O. White of Vineyard Haven, Mass., in 1941, by J. Milton Batchelor of the Hillculture Division of the Soil Conservation Service of the United States Department of Agriculture in 1942, and by Wilfrid Wheeler of Hatchville, Mass., in 1943. The Vieno T. Johnson prize went to Mrs. Ina Snow of Truro, Mass., in 1941, to William Foster of East Sandwich, Mass., in 1942, and was not awarded in 1943.

In 1941, Mrs. Wilfred O. White successfully petitioned the General Court of Massachusetts for funds for beach plum research to be carried out by the Massachusetts Agricultural Experiment Station. Mrs. White had long been interested in *Prunus maritima* on Martha's Vineyard and had previously started experimental plantings at her own expense. (63) With the passage of the desired legislation, the work started by Mrs. White was handed over to Professor John S. Bailey and trans-

ferred to the Cranberry Station of East Wareham, Mass. Although hampered by small appropriations and war-time lack of personnel, this beach plum project has made a certain amount of progress in the study of propagation, pest control and general culture.

The recognition given to Mr. Batchelor and Mr. Wheeler was largely for the work which they have done in scouting the coastal areas for beach plum plants having particularly worthwhile fruits. Over a three-year period prior to the outbreak of the war, Mr. Batchelor is reported to have found and evaluated by a score card method more than 50 selections, of which he is said to have considered at least 10 to be outstanding with respect to erosion-resistant and fruit qualities. The area surveyed in the course of selection work extended from the coastal region of northern Virginia northward to northeastern Maine, Cape Cod, Martha's Vineyard, Nantucket and Long Island. His selections are still under test and thus are not yet available for general distribution. Nor have descriptions of them been published. However, some of the more promising forms are now beginning to emerge from the preliminary testing stage.

A letter from S. B. Detwiler, Research Specialist of the Soil Conservation Service, states that the five top selections of beach plums made by Mr. Batchelor are being propagated in the nurseries of the Soil Conservation Service for field tests at Beltsville, Md. They will be made available to cooperators as stock is produced in quantities. The Hillculture Numbers and plant and fruit descriptions of four of these selections are as follows:

HC-1240—Fort Hancock, N. J.—Shrub 2½-5′ high, 45′ spread, fruit matures Aug. 25 to Sept. 10, reddish blue, 18 to 24 mm., very attractive, clean; vigorous growing (Average 1938—2 to 2½′); exceptionally heavy bearer and loose open stoloniferous habit. 1938 rating 82.3%.

HC-1244—Fort Hancock, N. J.—Small shrub 3′ high; foliage exceptionally clean, 4-6″ annual growth; fr. 20-25 mm., flavor excellent for eating raw—sweet with little acidity; flesh, juicy golden; pit, small; matures Aug. 17 to 25; yield 1938—1½ qts.; fr. very clean and highly attractive blue. 1938 rating 85.7%. Considered best early maturing selection.

HC-1252—Plum Island, Newburyport, Mass.—Prostrate spreading; bush to 4′, 30-35′ spread; clean-heavy bearer; fruit 23-25 mm., sweet, good flavor, attractive deep blue, matures Aug. 15-28. Mr. Stafford "best beach plum on Plum Island." 1938 rating 78.2%. 1939 rating 80.9%.

HC-1358—Plum Island, Newburyport, Mass.—Shrub 4′ high with 20′ spread; foliage generally clean; fruit 24-25.5 mm. diameter (25 fruits averaged 24.5 mm.), good blue, attractive medium productivity, badly infected with brown rot. Best selection observed on Plum Island and the best selection of beach plum from the standpoint of field ratings. 1941 rating 86.5%.

The fact that two of these seemingly worthwhile clones are native to Plum Island recalls the report of 1784 by Manasseh Cutler that several varieties of "Beach or Sea-Side Plumb" could be found growing plentifully on that island. The Reverend Mr. Cutler further stated that: "The fruit of some of them, when fully ripe, is well-tasted."

The fifth of this group of Mr. Batchelor's outstanding selections is HC-1248 and was given a 1938 rating of 74.6%. Mr. Wheeler has already introduced it from his own propagation under the name of "Eastham." Mr. Wheeler has supplied the following descriptions of Eastham and of two others of his findings.

Eastham—Origin, Town of Eastham, Cape Cod. Bushy habit about 3-4 ft. Inclined to be of spreading habit. Covering area 110 feet across. Stems upright and strong. This selection produced 25 to 30 bushels of fruit in 1941 and is reported to normally bear 15 bu. annually. Carries fruit well off the ground. Leaves bright light green, long, slender. Fruit large (21 to 24 mm. in diameter) to very large average 1⅜″ in diameter, color a deep purplish crimson, very attractive heavy bloom, borne along the stem in heavy masses. Quality tart but ripening to mildly acid. Seed small. Season early September but holding well on the plant in good condition

for three weeks. Very attractive in flower, would make a good landscape plant because of its dense growth and enormous clusters of flowers and, later, fruit.

Cotuit—Origin Cotuit, Mass., Tern Island. A real beach plant rather spreading and low, 2-3 ft. in height. Leaves bright apple green, oval. Fruit medium size ¾-1" in diameter, often larger when not too many on the plant. Color when ripe beautiful amber. Fruit in solid masses completely covering the stems. This is really a fine eating plum when ripe, sweet and of a fine flavor. It would make a fine preserving plum, but if gathered before ripe has the real beach plum tartness. Seed small. Season very early, often ripening in late July, the earliest one that I know. Plant very attractive in both bloom and fruit. A good subject for exposed places. The color and quality of the fruit make it a good subject for home planting.

Wheeler Selection No. 6—Origin Truro, Mass. Plant an upright grower 3-5'. Spreading with strong stems. Leaves large deep green, oval. Fruit medium size averaging 1⅛", light blue, very attractive. Fruit borne in great profusion all along the stems. Has real beach plum flavor but ripening to a very sweet and good flavored, quality fruit. Seed medium size. This plant has a lot of character and most attractive both in flower and fruit, particularly the latter.

The renewed interest in the selection of outstanding forms or clones has brought the problem of how best to increase the original plants vegetatively. Obviously, the increase must be by vegetative means if the progeny are to resemble the mother plants in all respects. This is not a new problem and does not involve techniques peculiar to the beach plum. One kind of plum seems much like another as far as propagation is concerned.

What may have been the first reference to beach plum propagation was set down in 1714 by John Lawson, who wrote concerning "American Damsons" in his "History of Carolina" as follows:

> They grow anywhere if planted from the Stone or Slip; bear a white blossom, and are a good fruit. They are found on Sand-Banks all along the Coast of America. I have planted several in my Orchard, that came from the Stone, which thrive well amongst the rest of my Trees. (30)

This good old practice of planting from "the slip" is very much in general vogue today, now that "own-root" propagation has come into favor. Meanwhile, as stated previously, grafting or bud-grafting on roots of other species of *Prunus* has been resorted to, as witness L. H. Bailey's report that Bassett's American grew well on Wild Goose. Dr. Bailey also recorded that the Rumsom Nurseries worked the same variety on myrobalan plum and on peach understocks. Mr. Kerr of Denton, Md., got excessively large plants of selected beach plums by working them on *Prunus domestica* and found that *P. angustifolia* could also be used as an understock. (5)

Such practice is not a thing of the past. During the time Mr. Batchelor was collecting outstanding beach plums, attempts at own-root propagation apparently failed with those handling his material, because working on roots of *P. angustifolia* and *P. americana* was resorted to at the government station at Beltsville, Md. Also, Mr. Wheeler has told the author of the strong growth and quick-fruiting which he has achieved by working selected beach plums on roots of *Prunus americana*. Apparently the old, old practice of getting "own-root" plants by uniting scions and piece roots of the same plant was not tried.

The practice of planting from "the slip"—better known as raising plants from cuttings—may be carried out by more than one method. Beach plum cuttings may be made from either roots or stems, because sections of both these organs will, under suitable conditions, regenerate the whole plant.

The root-cutting method has been practiced with one likely plant or another for centuries. When applied to beach plums by the author, it has always given good results under rough and ready conditions. Propagation by root cuttings requires no long training in plant propagation, no greenhouses or

other expensive equipment and very little in the way of care once the cuttings are made and set in the rooting medium. The following outline of the author's methods is quoted from the magazine *Horticulture*.

The basic method consists of planting three- or four-inch sections of live root. With this principle as a start, all sorts of variations and niceties of technique can be developed, depending on local conditions. If no great quantity of plants is wanted, all that is necessary is to sever a root and pull the end nearest the mother plant up to the soil surface, leaving its finely divided portion in place. If this simple operation is done relatively early in the growing season, new shoots will break from the exposed end making an independent plant which can be dug in Autumn.

If volume propagation is intended, it is necessary to take up whole roots, preferably in Autumn. This can be done with or without lifting the mother plant. The old plant can be taken up and shorn of most of its sizable roots without much danger of its dying. In replanting, its top had best be cut away.

The roots, preferably of lead pencil diameter or greater, can be cut into short lengths with a pair of pruning shears. In cutting them up it is well to lay them all one way, keeping the ends which were towards the mother plant together. The root-cuttings can be planted vertically in frames, flats or open soil. If put in frames or open ground, their tops should be covered with an inch or so of soil. In flats in cold greenhouses, the tops are usually set flush with the soil surface. If the open-ground method is chosen, it is advisable to use cuttings of relatively large diameter, planting them horizontally at a depth of two to three inches. In both frames and open ground, the cuttings should be well mulched to prevent heaving during winter.

In greenhouses, growth of both top and root will start early, necessitating potting. These potted plants may be put into permanent locations in early Summer. In frames or open ground, the new plants need not be moved until the second Spring if the cuttings are given a spacing of three or four inches. In fact, if root cuttings are plentiful, it would be possible, under favorable circumstances, to plant several cuttings in each of the spots chosen for permanent locations. In any event, it seems best to make permanent plantings with plants no older than one year. Even under the crudest conditions, it is possible to get a 50 percent stand from root pieces. This is economically sound. (28)

Beach plum propagation by stem cuttings has thus far been limited to softwood cuttings, as far as careful investigation is concerned. The practice is by no means new, but it remained for W. L. Doran and J. E. Bailey of the Massachusetts Agricultural Experiment Station to check it over in detail. (14) Working at Amherst, Mass., these investigators proceeded as follows:

Cuttings were taken three times, first in early June when the diameter of the green fruits was about one-eighth inch, again in mid-June when they were about one-fourth inch in diameter and again in late June when the diameter of the average fruit was nearer three-eights inch.

All cuttings consisted of short side shoots, usually two to four inches long, entire and made with the basal cut at the base of the growth of the current year. Cuttings were obtained from several beach plums and were well mixed before treatment. Unless otherwise indicated, all cuttings were inserted in sand in an open bench in a greenhouse. Glass of the roof was whitened for shade, and cuttings were frequently but lightly watered. Ventilation was limited to that necessary in keeping the air temperatures down to about 90 degrees Fahrenheit on sunny days, for with such soft cuttings, high relative humidity is most important.

Untreated cuttings rooted poorly, only twelve percent in the first experiment and only eight percent in each of the other two. A few untreated cuttings taken in early June were still living, unrooted, fifteen weeks later. It is evident that the successful propagation of beach plum by softwood cuttings requires treatment of the cuttings with a root-inducing substance.

There is, however, nothing difficult about the use of such substances. As may be seen by reference to the accompanying table, rooting was most improved by a simple powder-dip treatment with Hormodin No. 1.

Cuttings taken at the same three times were also inserted in sand in a shaded and sash-covered coldframe. There, as in the greenhouse, the best rooting was of those treated with Hormodin No. 1. But, because of greater difficulty in regulating conditions, results were decidedly less good in the coldframe than in the greenhouse. If cuttings are taken when fruits are about one-eighth inch in diameter, and if they are then treated with Hormodin No. 1, there is, however, probably no insurmountable objection to a coldframe where no greenhouse is available. Temperature and moisture relations must be so controlled as to prevent wilting, and further work on that modification of the method is now in progress.

PERCENTAGES OF CUTTINGS OF BEACH PLUM WHICH ROOTED WITH AND WITHOUT CERTAIN TREATMENTS BY DORAN AND BAILEY

Treatments	*Cuttings taken*		
	In early June percent	*In mid-June* percent	*In late June* percent
Check (untreated)	12	8	8
Hormodin No. 1	80	60	36
Hormodin No. 2	68	24	24
Indolebutyric acid, 50 mg/l., 4 hours	56	28	28
Indolebutyric acid, 25 mg./l., 16 hours	52	20	4
Naphthaleneacetic acid, 12.5 mg./l., 16 hours	40	12	8

What might prove to be a far simpler stem-cutting method is that of hardwood cuttings—both top growth and basal etiolated. There is considerable literature on this subject as it applies to other kinds of plums, but the idea still remains to be tested as far as beach plums are concerned.

A common complaint about cutting-grown plants of both stem and root origin is that they are slow to develop. This slowness can be considered of little consequence when it is remembered that such plants have a potential life-span of a century or more. How long the grafted plants will maintain a productive existence is not known.

There seems to be a common belief that seedlings will grow more rapidly than either root- or stem-cuttings, especially seedling plants which spring up from stones planted in the desired permanent locations and never transplanted. This is not a new idea because as far back as 1784, Manasseh Cutler had stated that beach plum stones planted in a garden in a mixture of beach sand and loam would grow into fruiting plants in two or three years. (10a) This line of approach brings up a matter not peculiar to beach plums but one which is also characteristic of oaks, nut trees and other woody plants. Direct seeding versus nursery transplanting is an old, old horticultural argument with a literature of its own. (53)

If it proves true under test that direct-seeded plants outgrow nursery-grown cutting plants, direct seeding may prove to be the most practical way of establishing large plantings of beach plum. Mr. Batchelor, in the course of conversation with the author, proposed that seeds from likely plants be sown relatively thickly on the contour in sufficiently spaced rows and allowed to grow to the fruiting stage, at which time they could be thinned. By removing the plants with the poorest fruiting properties in the thinning process, the remaining ones of higher quality would be properly spaced and also benefit from not having received a transplanting check.

There is no report as to whether direct-sown seedlings will outgrow cuttings set in place and never transplanted. Planting unrooted softwood cuttings in permanent locations is next to impossible of satisfactory results. Root pieces can, under some circumstances, be placed in the field where plants are wanted. However, Mr. Batchelor's suggestion for direct seeding and subsequent careful selective thinning has merit.

Beach plums are subject to attack by numerous insects and several diseases —some peculiar to plums, and others more general in their feeding habits. In an unpublished study of the actual and potential insect enemies of *Prunus maritima* on Martha's Vineyard, Frank M. Jones listed the following—Plum curculio, tent caterpillar, browntail moth, fall webworm, gypsy moth and chain-streak moth. The plum curculio is, of course, a very ancient enemy and

one mentioned by Macfarlane and other earlier authors. On Cape Cod, the plum gouger is also a serious pest.

Dr. O. C. Boyd of the Massachusetts State College Extension Service is quoted in Tomlinson's bulletin on the subject of two important fungus diseases of the beach plum—"Plum Pockets" (*Taphrina pruni*) and "Black Knot" (*Plowrightia morbosa*), although Dr. W. G. Farlow had reported in 1876 that *Prunus maritima* "as far as our experience in southern Massachusetts goes, is free from the knot." (17) Also, Dr. E. F. Guba of the Massachusetts Agricultural Experiment Station reported the fruits of roadside beach plums on Nantucket infected with "Brown Rot" (*Sclerotinia fructicola*). (20) Brown Rot, he says, follows injury by the plum gouger, particularly in wet seasons. It will be recalled that Mr. Batchelor's selection HC-1358 was also infected with Brown Rot in its wild location on Plum Island. Dr. Guba has not found Black Knot on beach plums on Nantucket.

Whatever the pests, the following spray schedule was first proposed in 1938 in the first edition of Tomlinson's bulletin and has apparently proved effective in the tests given it in the intervening seasons, with the one exception of failure to control the plum gouger. In a letter to the author, Professor J. S. Bailey stated that arsenate of lead fails to control this relative of the cotton boll weevil. In his opinion, the plum gouger will prove to be the number one enemy of the cultivated beach plum. Otherwise, the following spray schedule is still to be recommended.

As for establishing and maintaining beach plum plantings, the technical details are still in the process of being worked out. Evidently the problem is being attacked in two ways. The first consists of applying cultural and pest control operations to wild natural plantings. The first move has, in many cases, been to prune the plants both as a help towards disease control and as a means of promoting new growth. Mr. Tomlinson sums up his observations on this point as follows:

> A study of the fruiting characteristics shows that fruiting buds form on the previous season's growth. Therefore, it follows that bushes that have made good terminal growth are the best producers. In many instances, bushes are aged and so crowded with weak growth that little or no terminal growth is produced. Such bushes seem to flower profusely, but they are so weak and lacking in vigor that they either fail to set fruit, or if set, the crop is very light. There seems to be some indication that the two diseases mentioned (Plum Pockets and Black Knot) are more prevalent on aged bushes than on young ones. Those inclined to experiment might well try the following pruning methods: (1) remove all the top growth with a brush scythe, (2) remove all dead and weak branches, and several of the older stems to make room for new growth. The latter seems the more practical from a horticultural standpoint, but the former may prove to be more efficient from the standpoint of

Time of Application	*Materials*	*Pests*
No. 1—Spring dormant, any time before buds break.	7 gals. liquid lime sulfur to 100 gals. water, or 1 gal. to 15 gals., or 1 qt. to 3½ gals.	Plum Pockets Black Knot
No. 2—Just before blossom buds open.	1 gal. lime sulfur to 50 gals. water, or 1 pt. to 6 gals., or with dry lime sulfur ½ lb. to 6 gals. water.	Plum Pockets Black Knot
No. 3—As shucks fall.	Wettable sulfur as recommended by manufacturer, and 3 lbs. lead arsenate to 100 gals. water; or wettable sulfur, and ½ oz. lead arsenate (2¼ level tablespoons) to 1 gal. water.	Leaf Spot Curculio Brown Rot Plum Pockets Black Knot Plum Gouger? Tent Caterpillar
No. 4—Ten days to two weeks later.	Same material as in No. 3 spray.	

economy. However, it would require about two years for bushes to come into production again. All pruned twigs should be gathered in a pile and burned.

These suggested pruning methods look only towards fruit production. However, where the plants are grown for flowering effect only, pruning, if necessary, should take place immediately after the blooms fade. (6)

The second approach to beach plum culture is the setting of relatively large plantings expressly for fruit production. Because of the natural adaptation of the plant to well-drained sites, it is felt that *Prunus maritima* can be made a profitable crop on land not suitable for more conventional agricultural plants. In fact, the Soil Conservation Service is investigating the use of the beach plum as a soil binder on sloping areas which, in addition to being unproductive agriculturally, are subject to quick erosion. Some idea of how to make such plantings may be gained from reading the report of Iowa experiments with the hillside culture of varieties of *Prunus domestica.* (1)

Mr. Tomlinson reports that on Cape Cod several interested growers have already made a beginning by digging up young bushes and transplanting them to fields which had previously been plowed and harrowed as for any cultivated crop. He states that:

> Young bushes are easily transplanted in the early Spring from the middle of March to the middle of April. They should be planted at least ten feet apart each way, and cultivated enough to keep down weed growth. The beach plum bush will respond to fertilizers, but no data are available to guide growers in its use. Until more information is obtained, growers may well experiment with various fertilizer mixtures, taking care to include check rows on which no fertilizer is applied in order to observe and compare the results more accurately. The writer has seen transplanted bushes making growth measuring two to three feet in one season where a little nitrate of soda was used as a stimulant. In general, it may be better to defer field plantings on a large scale until more desirable varieties become available.

The general feeling at the moment is that where commercial plantings are contemplated, growers would be well-advised to work up stock of superior selections, or to buy young plants known to bear large-sized fruits of suitable quality—especially those having small stones—rather than to transplant wild seedlings of unknown fruiting properties.

The foregoing is a summary of the beach plum story as the author found it recorded in botanical and horticultural literature, and as he has picked it up by word of mouth. His search of that literature started with a personal desire to learn what others have reported about this interesting wild fruit. While he is certain that he has reviewed most of the significant written accounts, some references may have escaped his attention. Therefore, he would welcome any additions or corrections that may be necessary to properly synthesize the subject and make the story complete for the use of the hundreds of persons interested in the economic exploitation of *Prunus maritima.*

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A Few Proteaceae

W. M. James

The family, Proteaceae is found in the Southern Hemisphere only, although there is inconclusive evidence that some of them grew in Europe at one time. Most of the members of the group, especially those found in South Africa and Australia are characterized by peculiar and unusual habits of growth and a wide difference in appearance and size between closely related members. All of the descriptions and photographs are of plants grown from seed on the private estate of Mr. and Mrs. William R. Dickinson near Santa Barbara, Calif.

In South Africa the members of the Proteaceae are found mostly in the mountains and southwestern regions. Some kinds are extensive enough in certain places to suggest their name for that area, such as the Protea Veld in the Drakenburg mountains. Some of them, especially those growing in the mountains, are pubescent or hairy. The study of their ecological evolution is very fascinating.

Proteaceae from South Africa proved to be much more difficult to grow than those from Australia. This may be due to the alkaline soil in Santa Barbara. There is some evidence that a mycorrhizal fungus, such as is found with some of the Ericas in South Africa, is necessary. Some of the more widely distributed, such as the Proteas, lived only a short time and were never thrifty looking.

Leucadendron argenteum, the Silver Tree, is probably the most widely known of the Proteaceae from South Africa. The silver gray foliage and its interesting fruiting habit make it a tourist attraction in its native land and a fascination for most people no matter where they see a plant growing, or even just cut branches. The Silver Tree has been grown in Southern California for many years, but has generally been short lived. The size and age of the trees on Mr. and Mrs. Dickinson's Estate indicate it to be a very favorable situation for these plants. They apparently prefer a light, deep, well-drained soil with a regular supply of water throughout the year and damp, cool air.

There are seventy-five species of *Leucadendron* and it is the only genus of Proteaceae known to the writer which has pistillate and staminate plants. The flowers are borne on the end of the branches and a staminate tree presents a striking appearance in the spring when the anthers are open, every branch tipped with a golden ball about one and one-half inches in diameter. It is also the only one of the Proteaceae grown by the writer which does not "break out" or start new growth from the stub when a branch is cut. Growth starts near the tip of the branches in the spring, and is so close together that it is whorl-like in appearance. After the new growth hardens in late summer, it cuts well and makes very pleasing arrangements.

Leucospermum has forty species. Two of these were grown to flowering age. *L. reflexum* is an attractive shrub with pubescent leaves and a striking orange colored florescence. As in most of the Proteaceae studied, what appears to be a single large flower is a more or less tightly arranged group of small individual flowers.

Most of the Proteaceae from Australia are very different in character and appearance from those in South Africa. The foliage and seed pods are

Leucadendron argenteum

Pistillate cones showing receptive pistils, mature cone and opening cone with seed falling.

Leucadendron argenteum
Staminate cones in different stages

Leucadendron discolor
Pistillate flowers

generally tough and leathery, presumably to withstand at least semi-desert conditions. They seem to prefer a light sandy soil with plenty of drainage. Some of them, such as *Grevillea robusta,* will do well in nearly any kind of soil.

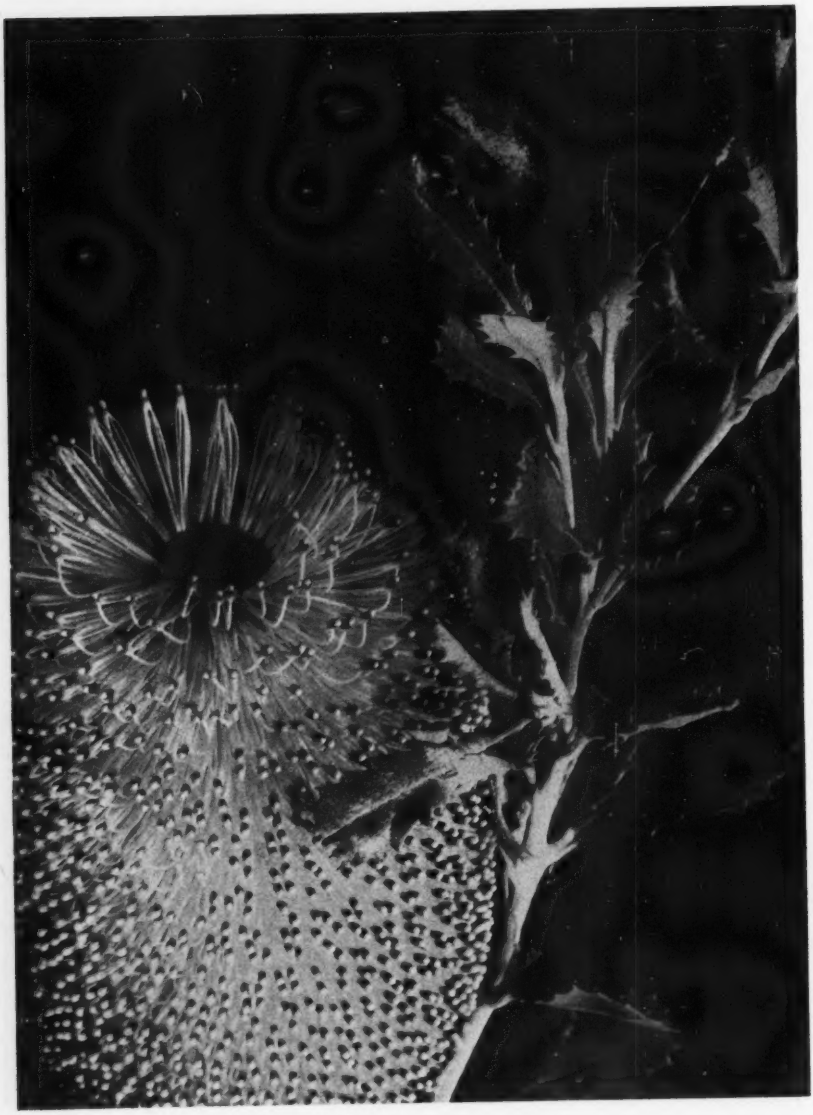
Banksias range from shrubs to trees. Some of the leaves are smooth and shiny—others feel like plush. The photographs give a much better idea than any description could. Some kinds have drops of nectar in the flowers. Bees visit them in large numbers and quite a few get caught and die.

Banksia grandis is one of the largest with deeply indented leaves over a foot long and a yellowish-green inflorescence the same length. On the other extreme *Banksia mesnerii* has leaves which closely resemble those of a fir tree. The inflorescence of this one is lavender and the very irregular seed pods resemble a malignant growth in some respects. *Banksia speciosa* has narrow grayish leaves eight to ten inches long which resemble rick-rack braid. *Banksia media* is a low round growing shrub with green leaves which resemble those of some of the oaks and has a bright yellow inflorescence. *Banksia occidentalis* has bright red flowers. All kinds cut well and some of them make exceptionally interesting arrangements. *Dryandra* resemble *Banksia* in many respects.

The *Grevilleas* include tall timber trees, which are extensively used for cabinet work, and also trailing shrubs. *Grevillea banksii* is a shrub with bright red flowers. The foliage affects some people the same as "poison oak" and "poison ivy." *Grevillea robusta* is a large tree known as "silk oak" in Australia and is one of those whose wood is used for furniture and cabinet work.

Leucospermum reflexum

Banksia grandis



Banksia media

Banksia Mesneri
Flowers

Banksia speciosa

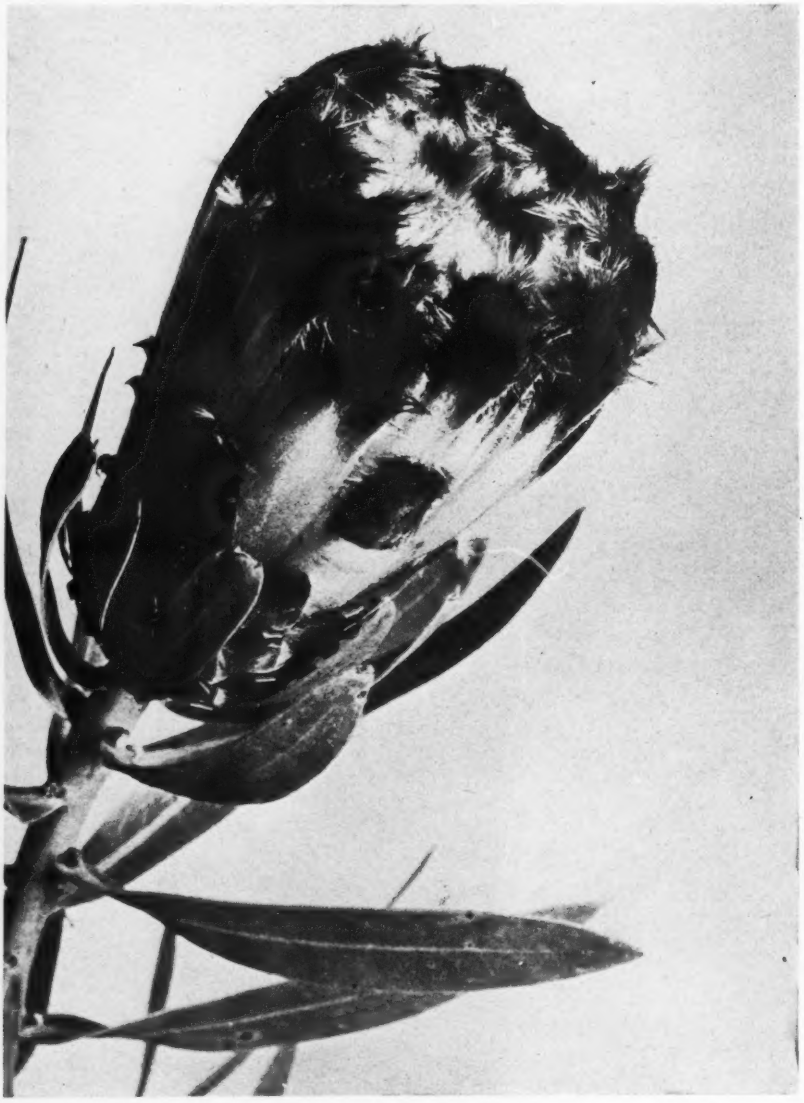
Banksia occidentalis

Dryandra formosana

Grevillea obtusifolia

Hakea laurina

Hakea suaveolens



Protea lepidocarpodendron

About three quarters natural size

Isopogon latifolium

About half natural size

The leaves are very ornamental and while small the plant makes an attractive indoor potted ornament. *Grevillea obtusifolia* goes to the other extreme and is a trailing shrub with red flowers. The picture shows a single plant which was twenty feet in diameter and about one foot high at the time it was taken.

Some of the *Hakeas* have been and still are extensively planted in Southern California. Unfortunately they generally receive too much water and grow a large top without many roots. Because of this, the plants frequently break down during heavy rains or wind storms. It is an excellent shrub for dry locations. *Hakea suaveolens* has round leaves which are hard and stiff and tipped with a sharp point.

Macadamia ternifolia is a beautiful small tree bearing delicious nuts, which have very hard thick shells, that are difficult to crack. It is native to Queensland and will not stand many degrees of frost.

The *Petrophilas* are a peculiar desert-like group. *Petrophila biloba* has small, hard leaves with points sharp enough to scratch the skin and draw blood. *Petrophila serruria* (not pictured) has branches completely surrounded by bristly pointed leaves arranged so that the whole branch resembles a curving bottle brush, three to four inches in diameter.

There are many more Proteaceae in Australia, a few of which the writer has seen and not been able to photograph. Seeds are scarce and have to be gathered from the native plants in Australia. Some of the seed pods are difficult to open. Pods from *Banksia speciosa* were frozen, baked in a hot oven and soaked in water without being affected. Seeds obtained by sawing open the pods germinated nicely and the plants grew as well as those from imported seed. Many of these "Australians" were introduced in Southern California several years ago, but few of them reached maturity because they were coddled too much. They are difficult as seedlings until they are about twelve inches high, and from then on they should be watered sparingly. Many of those from Australia propagate from cuttings readily. The writer was unable to grow any of those from South Africa this way. If handled properly, many of the Proteaceae would make quite an interesting addition to the gardens of Southern California and possibly those in southeastern United States where it is not too wet.

From South Africa is *Protea lepidocarpodendron*. Its common name of "Fringed Black" Protea describes its appearance quite well. The shiny black color and fringe-like hairs make it a striking and unusual flower.

From Australia comes *Hakea subsulcata* and *Isopogon latifolium*. *H. subsulcata* has small pink flowers. The stiff woody leaves are about one-sixteenth inch in diameter and four to eight inches long. It is a typical desert plant. *Isopogon latifolium* is quite interesting and different from the other species which have bloomed in Santa Barbara. The leaves are stiff and thick. The flowers are light lavender. Note in the photograph the very long, slender tube of each one.

These plants were all rather small when they flowered. The writer knows nothing of their ultimate size or longevity under Santa Barbara conditions.

Ojai, Calif.

A Book or Two

Shrubs of Michigan. Cecil Billington. Bulletin No. 20, Cranbrook Institute of Science. The Cranbrook Press, Bloomfield, Mich. 1943. $2.50.

Shrubs of Michigan is intended to be a non-technical description of the shrubby plants of Michigan, although the author admits that for accuracy's sake a certain amount of technical language is necessary. However, he goes to considerable effort in the glossary to show the meaning of the terms used and to make the technical words intelligible. Furthermore, for a non-technical monograph, he has gone to unusual lengths to check his observations in the major herbariums of the State to insure accuracy and completeness.

Mr. Billington has enjoyed the hobby of hiking over the State in search of plants and while this book is limited to those falling within the shrub group, he shows the value and fun of such a hobby. Besides describing the plants, the text contains small maps showing the distribution of each within the State and in carefully done illustrations gives the details of foliage and flowers.

The entire book is well organized and of interest to botanists, plant ecologists and plant hunters. Even the layman can make use of such a book if he is interested in knowing more about the beauties of nature which grow about him.

W.H.Y.

Horticultural Colour Chart—Volume II. Published by the British Colour Council in collaboration with the Royal Horticultural Society, Vincent Square, London, S. W. 1, England. A second series of 100 color plates in portfolio with explanatory leaflet. Price 21s 10d. Published March, 1942.

It is now two years since this second volume of the *Horticultural Colour Chart* was published but owing to shipping difficulties and to the stress of other activities the reviewer has not been able to give this excellent work the attention which it demands.

Before commenting on the volume attention should be called to an error which occurred in the first series of plates. The color blocks on Plate 1 (Sulphur Yellow) should have been on Plate 64 (Dresden Yellow) and those on 64, on Plate 1. The two corrected plates are included with this series so substitution may be made by those who have purchased the first set and the following notation is made:

"ERRATUM

"It is regretted that in the collation of the 1st volume a transposition of 2 colour plates has been found, namely No. 1 and No. 64. With the 2nd volume 2 new plates are enclosed. Would you be so good as to destroy the incorrect plates in your possession and replace with corrected plates."

The present series consists of 34 (lighter) Tints, 28 (darker) Shades and 38 Greyed Hues. The plates are numbered, based on the numbering of the first series, so users may re-arrange the full series in color gradation and an index of pagination is given in the explanatory instructions which accompany the present issue. The same system used in the first series is followed; tints and shades being raised to numbers in the hundreds with the base numbers (1 to 64) appearing as the last digits. The "Greyed Hues" are numbered by placing ciphers before the base numbers, as *o* meaning once grayed, *oo* meaning twice grayed, *ooo* meaning thrice grayed. Thus we have

a series for each color grouped around the basic color of lighter and darker gradations and grayed dilutions. This may the more easily explained by citing an example:

'61	Pea Green	the full hue
o 61	Pod Green	the full hue once grayed
ooo761	Lavender Green	shade of 61 thrice grayed
861	Lettuce Green	darker shade of 61
ooo861	Sage Green	darker shade of 61 thrice grayed.

Attention is called, in the Introductional Leaflet, "that the darker shades are more intense and richer in colour than those shown in other charts, the depth and intensity having been obtained by the use of intense coloured inks rather than by deepening with black, the method generally employed to obtain the darker shades.

"For this reason no equivalents from the range of Ridgway's 'Color Standards and Nomenclature,' Rene Oberthur and Henri Dauthenay's 'Repertoire de Couleurs' or Istwald's Colour System can be recorded for these intense colours, especially from the 'Repertoire de Couleurs' where the paper used was a gray-white in comparison with the purer white of the Horticultural Colour Chart."

With this volume we now have 800 hues, tints, shades and tones of the seven colors of the spectrum. It is hope that a third series will be issued shortly after the war and will include grays and browns. For horticultural purposes these two colors are almost as important as the seven of the spectrum for they are needed in recording the color of bark, stem and thorns; the markings of various flowers; signal patch and beard of irises and pollen.

It will be a happy day for gardeners when the use of this color chart becomes more general and not only botanists follow its color names but nursery catalogs also. Then no more will the "blue" of a much lauded new plant turn out to be a pinkish light purple and the "golden" prove to be a dirty greenish yellow. Those of us who are interested enough in our plants to keep garden notes might begin to check their colors with this chart and to use the terms in our descriptions. By so doing we would set an example to the nurseryman and in time get him to issue a more exact catalog, not only to his great advantage but for the education of the coming generations of gardeners.

A few copies of this second volume are available to our members and may be purchased from our office at $4.00.

A. B.

Plants and Flowers in the Home. Kenneth Post. Orange Judd Publishing Company, New York, N. Y. 1944. 198 pages, illustrated. $2.00.

This is probably the most accurate and best organized presentation of the culture of house plants which is available in a small volume, and should be useful both to the multitudes of amateur window gardeners and the professional florists. Notes on propagation, culture, diseases and insect pests are given for the various plants. The book is more than a compilation and much information on methods of automatic watering and various types of solution cultures is based on the researches of the author at Cornell University, where the author is a member of the faculty in horticulture. Suitable environmental conditions are discussed in great detail for the various plants.

The author has almost no suggestions regarding the decorative uses of the plant materials which he discusses, except possibly in the section on window boxes. Modern interior decorators have achieved striking results with

plants as an integral part of the design, and there is still much room for experimentation. Perhaps the author considered such a discussion superfluous because of the flower arrangement cults which have been so popular in the recent past. Nevertheless, to us, the use of plants in the average home or hotel lobby has usually seemed somewhat unsatisfying and unimaginative. Perhaps a psychoanalyst would trace the dissatisfaction of the reviewer with so many attempts to use decorative plants to his childhood days in a prairie town where during the long winters the windows of the houses were crowded with sprawling begonias, dormant fuchsias and geraniums, spindling coleus, and numerous others, all tended with meticulous care, perhaps as symbols of life and spring! In more recent years we have seen the identical displays in the crowded poorer sections of vast cities. In a little higher *stratum* in certain cities, nearly every home has or did have a plant of *Ficus elastica*! The oriental peoples believe that a certain psychological state is necessary in viewing a floral arrangement or a house plant. We incline to this view, and we are charitable enough to admit that a rubber plant or any of the numerous other species described by Professor Post can have a profound symbolism and can be expressive of the highest beauty.

V. S.

Vegetable Gardening in Color. Daniel J. Foley. The Macmillan Co., New York, N. Y. 1943. 255 pages, illustrated in color. $2.50.

This book may be characterized briefly by stating that it is the latest in a series of books by the author and associates featuring garden flowers, bulbous plants, and roses, copiously illustrated with color plates, most of which have appeared previously in commercial catalogs or other publications. Those gardeners who enjoy the seed catalogs will want this book.

The author writes largely for the beginner in vegetable gardening, who will find here some essentially sound and helpful advice on many matters, including the starting of plants, choice of varieties, small fruits, culinary herbs, and storage of vegetables. Some unusual ways of cooking and preparing vegetables are described. The author does not attempt to present planting and harvesting schedules for the numerous climatic zones of the country and most inexperienced gardeners will need to supplement this book with advice from local gardeners or bulletins from the state experiment stations. The author writes in a pleasing, flowing style and has produced a readable volume as well as a picture book. Doubtless the book will render useful service in the Victory Garden Program.

V. S.

Observations on Moraea Iridoides

W. C. Blasdale

The article by Knight Dunlap in the January issue of this Journal should arouse interest in the minds of all who find pleasure in the companionship of plants, whether as horticulturists or as botanists. I also had marveled at the abrupt breaks in the continuity of the long flowering period of plants of *Moraea iridoides* growing in this vicinity. Mr. Dunlap finds the flowering periods are separated by intervals of about two weeks and correspond to certain changes in the phases of the moon. He suggests therefore that this periodicity is due to lunar influence. Without in any way disparaging the accuracy of his observations I think the correlation will fail to carry conviction until confirmed by the observations of many others. This paper contains such observations as well as additional material relating to this species.

Moraea irioides is one of the numerous "Cape bulbs" which was discovered by Peter Thunberg in Cape Colony "in a wood." Later it was found in Natal and as far north as Zambesi Land. Seeds of it reached England in 1758 from which plants were easily brought to the flowering stage when grown in cool greenhouses. A much finer form of it, with four- instead of two-inch flowers and petals of greater substance was discovered by J. Medley Wood of the Natal Botanic Garden, twenty miles from Durban, at an elevation of 2,000 feet. This form was cultivated by him at the Botanic Garden and seeds of it distributed to the leading Botanic Gardens of Europe and elsewhere after 1882. It seems to be identical with the form now widely grown under the varietal name *Johnsonii*. This name was first associated with plants which had been grown in the mountains of Ceylon for many years and reached England in 1906. Since this species does not grow naturally outside of South Africa it is probable that the Ceylonese plants, and therefore the strain now grown in California and elsewhere under the name of *Johnsonii*, are descendants of that discovered by Wood. A second variety, *catenulata*, also grown in California, yields flowers of equal size and substance with a double row of yellow spots on the lower portion of the three larger petals.

Botanically the genus *Moraea* is assumed to be the South African representative of the genus *Iris*, from which it is most easily distinguished by the fact that the flowers lack a perianth tube and are therefore shorter and more flattened than those of species of Iris. Thunberg called the species *Iris compressa*, as the genus *Moraea* had not been recognized at the time he discovered it. Linnaeus in 1753 transferred it to the genus *Moraea* and gave it the specific name *iridoides*. This and two other species of the genus, namely *M. bicolor* and *M. Robinsoniana*, differ from the eighty or more other species now known in that their root system is based on a series of short stout rhizomes instead of corms and the fact that the leaves and flower stalks are perennial. These and other differences have convinced certain botanists that these three species constitute still a third genus to which the name *Dietes* has been given.

I find no reference to the peculiarities of the flowering period noted by Mr. Dunlap in the published descriptions of the species. There are comments on its long flowering period by those who have grown it both in England and California. It is conceivable that the California-grown specimens have acquired the habit of periodicity in this

Fig. 1. A plant of Moraea iridoides growing in full sunshine, Berkeley, California, August 26, 1943.

new environment. Assuming that the climate of Natal is typical of its habitats this species is adapted to a warm-temperate or semi-tropical climate whose annual rainfall reaches forty inches, most of which falls during the summer months, leaving the winter relatively dry. These features are in marked contrast with the dry summers and wet winters of California, differences which can be offset by artificial watering during the summer provided that the excessive rain of the winter does not lead to decay of the root system. Most of the many species of Cape bulbs extensively grown in California produce their flowers in spring or early summer and are dormant for several months of the year. I recall none except this species of *Moraea* which has perennial foliage, a feature which should be favorable to a long period of bloom.

My observations on the flowering periods of *Moraea iridoides* began in February of this year and concern a single large plant (Fig. 1) growing in my garden. This plant has never been fertilized or given much care; it was watered occasionally from March 1st to July 10th and again from August 18th to Oct. 1st. No flowers were perfected during the cool weather lasting until about May 1st. During the entire period each blossom was tagged with a bit of string on the day it opened, the color of the string used being changed at each successive flowering. The total number of flowers opening each day and the total number for each period was recorded. The data thus obtained was summarized in the accompanying graph (Fig. 2) which also shows, by means of conventional signs, the data at which changes in the phases of the moon took place. The periods during which a large number of flowers opened occurred at approximately monthly intervals. They were interspersed with periods in which a much smaller num-

Figure 3

ber of flowers were produced. The normal interval over which the flowers remained open was two days; during a hot spell they lasted only one day but during cool, sunless days some lasted for three. The absence of all flowers for nearly four weeks in August seems to be related to the withholding of water at about the same period. Variations in the intervals separating both major and minor flowering periods are notable and I am not able to discover a satisfactory correlation between them and the phases of the moon. My observations show shorter flowering periods and greater variations in the intervals between them than those of Mr. Dunlap, yet I know of no other plant which shows such a well-defined periodicity in its flowering habits. The evanescent character of the flowers makes this periodicity more obvious and it is possible that other species would exhibit similar periodicity if similar records were made of the dates at which their flowers opened.

One can scarcely avoid making speculations as to the cause of this peculiarity of this species. I would therefore call attention to two sets of facts which may have some bearing on the phenomenon. First, this species is one in which, at least in cultivation, a large percentage of the flowers never even begin the formation of seed capsules. Up to date my plant has produced 174 flowers and only eleven capsules have begun to form. I have watched four other plants growing in neighboring gardens and find a similar situation. Second, it may be recalled that periodicity in the yearly cycle of perennial plants, indigenous to temperate regions, is a well-established phenomenon since such plants, when grown in different climates, preserve with little change the order of succession and the length of duration of each part of the cycle to which they have become adjusted. One of the features of such cycles is a single flowering period, usually of short duration, which may occur at almost any season of the year. However there are certain tropical or semi-tropical species whose flowering periods are both long and continuous. Examples of such plants in cultivation in this region are *Abutilon megapotamicum, Bougainvillaea spectabilis, Plumbago capensis, Lantana Sellowiana, Ipomoea Learii, Streptosolen Jamesonii,* and *Hydrangea macrophylla.* These plants produce little or no seed; some of them flower freely throughout the calendar year. *Moraea iridoides* may represent a species which is on its way to become a continuous flowering species of this class, in which periodicity is only an incidental feature.

Attention has been called to the fact that the species under consideration is peculiar, in contrast with the large number of Cape bulbs in cultivation, in that its foliage is more or less active during the entire year. Its flowers originate from a perennial jointed branch, each joint distinguished by a sheathing leaf-like bract. An examination of the sheaths which enclose the terminal joints reveals rudimentary flower buds even at an early stage in the development of such joints. Lateral branches arise from the sheaths defining certain of the lower joints. Finally, entirely new many-jointed branches arise from the root system itself from time to time. This mechanism provides a potential magazine for the continuous production of many flowers. I am unable to discover in it any feature which necessitates periodicity in the dates at which the flowers appear.

Having now used many words without having arrived at a solution of the problem presented by this species I want to use a few more to avoid leaving certain misapprehensions in the minds of my readers. I certainly have no desire to condemn this species of

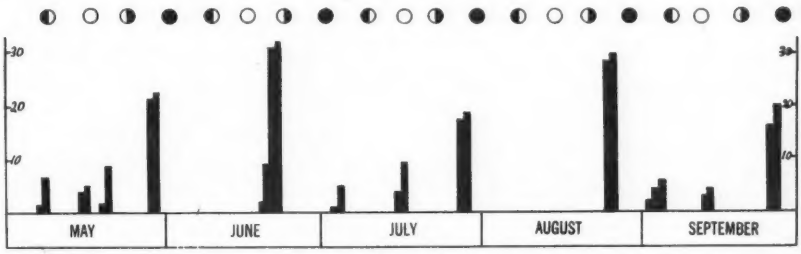


Figure 2

Moraea because it has introduced into its life cycle an unconventional method of opening its flowers and I am not oblivious to its merits as an ornamental. I have learned to look forward with pleasurable anticipation to the swarm of white, yellow-streaked butterflies which settle on its somber foliage periodically during several months of the year. To be sure each period of loveliness lasts only two or three days and the wings of the butterflies soon begin to droop after being removed from the stalk. Similar defects characterize a number of long-cherished species of iridaceous plants. As shown in the accompanying photograph (Fig. 3) both the outer and inner rows of the perianth segments are sustained in approximately the same horizontal plane. The former are brightened by a stripe of yellow culminating in a crest of short hairs of the same color. The latter are marked, near their point of attachment, by a few chocolate-colored lines. The lower portion of the style is erect but the long petal-like lobes into which it divides are ascending, suffused with lilac, and deeply cleft. I know of no more beautiful representative of a family distinguished by the brilliancy and artistic design of its flowers.

The installation of the mechanism which will insure the arrival at stated intervals of thees swarms of beautiful butterflies is, at least for residents of mild climates, a simple matter. A small group of closely-matted torn from a growing plant, when buried in almost any kind of soil, in an open situation, will rapidly develop into massive clumps of foliage which, in spite of the abundant rainfall to which the plant is accustomed, will produce fair crop of blossoms even when given little water. In this locality it is not injured by moderate frost. During an unusually cold spell some years ago, with fifteen degrees of frost, the foliage was killed but was replaced by fresh growths with the advent of warm weather. It ought to succeed in many of our southern States and even in the North Atlantic seaboard ones could probably be wintered over if grown in pots and kept in a cold greenhouse or cellar during the cold weather.

Finally it might be noted that *Moraea Robinsoniana*, the nearest relative of *M. iridoides*, has been successfully grown in Southern California. This is a much larger-growing species, from an islet off the southern coast of Australia, the only representative of the genus found outside of Africa and the Island of Madagascar. It is decidedly more tender than *M. iridoides* and, grown from seed, requires many years to attain the flowering stage. Photographs show it to be a stately plant with leaves six or more feet long and flowers comparable in beauty with those of the related species. They last only a single day but are produced almost continuously over a period of a month. The third member of the *Dietes* triad, *M. bicolor*, is also grown in California but its light yellow, brown-spotted flowers lack the charm of those of the other members of the group.

The Gardener's Pocketbook

A Rock Garden in the Making

The prevailing idea of Arkansas is, rocks, rocks and more rocks. Our big garden is almost entirely free of them, except a few big, low, mossy outcroppings near the spring and under one group of oaks, just to the left of the walk running north along the base of the dry wall at the lower edge of the lawn. The rocks for the rockgarden have to be hauled in from the back pasture and the woods, so they are not as large as we would like. The soil is deep and good, for which we are thankful.

The garden site is beautiful, with cedars and oaks for a background and a clear little brook at its foot. A little stream in the garden has always been a dream, but now that it has come true I cannot seem to be able to use it as I had expected to. We had visions of an hydraulic ram to lift the water up the slight rise to the house and for use among the flowers, but that appears to be out of the question, at least for the present. So the lifesaving water flows away while above the plants die for the lack of it.

Dropping west, past the house on the north, in a series of broad, very shallow terraces, the garden merges with the rockgarden, where the slope suddenly breaks in a crisp little drop to the low, grassy bank of the brook, just before it slips under the garden fence to join the larger stream without. A fair sized oak grows just far enough north of this little slope to avoid giving it the shade the plants need during the heat of the day. The rockgarden faces squarely into the sun with no protection whatever. Plants do not burn here like they did in the old Kansas garden, but with such a drouth as visited us last summer, many, in fact most, of the choicer things vanished. One advantage of this has been, however, to cull the less hardy plants, leaving those that can live through this baking.

The tenderer, choicer treasures are going to have homes made for them on the west bank of the little stream where the ground stays moist in the driest time. This bank is higher than that on the house side as a number of mediumly large rocks form a retaining wall along the back of the brook. Here I think primroses should do well. At the base of these rocks where little bays in the brook can be filled in with rubble, behind a rough outline of stones, and topped with leafmold, I planted maidenhair ferns brought in from the hills, in others forget-me-nots. When everything else was brown and dead last summer, these little pockets were pictures.

Three broad, shallow, terrace-like steps in the grass, lead down from the front steps to where the walk divides three ways. One turning sharply to the north along the wall of the lawn; one angles off to the left, under the oaks on the front gate; the third almost straight ahead a few steps to the spring. The last step continues right in a dry retaining wall at the foot of the lawn. This I laid up, a tier at a time, to level that side of the lawn. There has never been any dirt hauled in but all the grass roots and cleanings from the rock garden, as well as the thick mats of water cress and roots that have to be cleaned out of the brook all winter long, have gone to make good rich loam. The wall is about two feet high now, at the far end and only one more line of flat stones needed to finish it. A low boxwood hedge will top the wall, with mats of *Saponaria occymoides* and an occasional clump of *deltoides* pinks falling down the face of it.

Across the walk at the base of the wall, among the mossy rock outcroppings are many of the choice native Ozarkians, such as violets, silenes, shooting star, bloodroot, rue anemone, phloxes and others. Here, too, the dif-

ferent hens and chickens, veronicas in close mats, among others are doing their best. One of the truly lovely plants along here last fall was *Sedum Seiboldii,* with its wheels of grey leaves, each spoke topped with clusters of soft pink stars. It is a beauty planted above a dark rock, so that the grey and pink has a sharp contrast, as it sprays downward. This is one of the very few sedums that is attractive in bloom.

Between this and the brook is still a damp mat of age-old grass roots that is almost impossible for me to dig out, but, a little at a time, the ground is being cleared and made ready for the choicer plants. Just north of this, at the foot of the rock garden slope, is a rock about the size of a washtub, standing on edge at about a forty-five degree angle. During the driest season a thin trickle of water came from under it and flowed down to the brook. This spelled a pool to me, so all one summer I spent my leisure time digging, until I had a nice basin. For some reason, it did not work. Now I am filling it up and think it should make a grand little moraine, as it has the steady underflow of water, with good drainage. I made a considerable fill of rocks before adding loam to allow for the under drainage.

MRS. H. P. MAGERS,
Mountain Home, Ark.

FROM THE MIDWEST HORTICULTURAL SOCIETY

Blueberries

There are many places in the midwestern region where the native blueberries and huckleberries are favorites in the summer months. However much one may enjoy the delicious fruit of these plants there is always the drawback of picking the low species and a lesser quantity of plants of the high bush species.

Since Dr. Coville and Miss White first started to improve the high bush blueberry there have been several excellent varieties produced. These have become so widely propagated that they are readily available to everyone. To persons who live in places where any of the blueberries thrive there is no bother at all to securing improved varieties and introducing them. Where such sandy or humus soils are not present then the problem of soil becomes important. Beds of peat, rotted oak leaves, sands fortified with humus, or soil from around wild plants are all suitable for blueberry culture. The soil situation as for azaleas and rhododendrons will be satisfactory. Plenty of sun is indicated.

The large size and prolific bearing of the fruit place the improved blueberries toward the top of desirable fruits for the small place. In addition to the fruit there is also the attractive shape of the medium sized bush which colors delightfully in the fall and the small clusters of flowers in the spring.

Certainly the highbush blueberry must be ranked as a dual purpose shrub —utilitarian and ornamental. As for varieties there is much opportunity for discussion but probably the older ones are more widely distributed, such as Rubel and Jersey, but individual taste will have to be the deciding factor.

ELDRED E. GREEN.

Fraxinus excelsior

While ash trees are no novelty in this region, they are not so extensively planted, most of the plants being volunteers. While the white or American ash is thus frequently encountered the European counterpart of it is a rarity.

In contrast to the white ash the European has a slightly larger and darker leaf, a more flaring, compact trunk, somewhat darker bark with slightly less furrowing, and leaves that remain on until late in the fall. The tree is inclined to an umbrella shape and is excellent as a shade tree. It appears that this species grows more slowly than the native one but is probably longer lived.

The untidiness of the common species is lacking, and the compact growth and dark gloss of the foliage make a specimen quite noticeable.

While not commonly carried in most nurseries, this species can be obtained from several sources and will prove to be a different and desirable addition to the shade trees of this region.

ELDRED E. GREEN.

Hibiscus syriacus

During the late summer and fall of the year there is a dearth of flowering plants especially in shrubby material. At this season the Rose-of-Sharon (*Hibiscus syriacus*) stands out as a colorful exception. The common varieties are red, purple and white in single and double forms.

There has been some disparagement of this species by statements of its lack of hardiness but this is not borne out by the age and size of many specimens to be seen widely distributed in this region. It seems more than likely that any lack of hardiness can be either attributed to uncongenial surroundings or planting of too small plants. In some winters there is some die-back on some of the smaller branches but this is not fatal unless the plant is very small. Because these plants bloom on wood formed during the same season freezing does not cause a failure of flowers.

Soil conditions do not seem to seriously influence growth of the Rose-of-Sharon. I have seen excellent plants in loam, sandy soils, and clay. An open position gives better results than shade. In planting the future size of the plants should be kept in mind as these shrubs will attain ten or twelve feet in height with a spread of about two-thirds of the height. Certainly for continuous bloom in the shrub border, or as a summer accent in the garden the forms of *Hibiscus syriacus* must be accorded a high place in midwestern gardens.

ELDRED E. GREEN.

Calycanthus floridus

The Sweet-shrub (*Calycanthus floridus*) is one of the natives that is found in the southern parts of the eastern region but that is perfectly hardy in a much wider range.

In the early spring the chocolate colored rather fragrant flowers are quite noticeable. These are on short branches. Later the large oval leaves appear on the scattered stems of the plant. These large leaves on a spreading type of low (2-3 ft.) shrub give an exotic, almost tropical appearance in contrast to the usual type of shrubs in this climate. As fall comes on these leaves turn an attractive yellow before dropping.

This plant seems to fare rather well in shady spots and so suggests itself for use with ferns and woodland flowers.

While listed as growing to ten feet in its native range it can safely be stated that not more than half this height would be attained in this climate except under unusual conditions. Old plants are generally between three and four feet.

This shrub is one that has creeping underground stems and so should not be planted where it will be too confined or where it will crowd into other woody plants. A foundation or background shrub for herbaceous material or naturalizing seems the best situation. This is a different and desirable shrub at all seasons of the year.

ELDRED E. GREEN.

Rosa setigera

One of the less common roses that is native to a wide range of the middle west is the Prairie Rose (*Rosa setigera*).

My first encounter with this rose was in the region of Starved Rock where it had overrun an abandoned pasture. The arching stems of the plant formed mounds about five feet in height and equally as broad. These verdant

mounds were covered with hundreds of large rose-pink flowers. This rose has been rather extensively used since then in the plantings in the Starved Rock State Park. This rose is found in many other places and even invades the suburban region adjacent to Chicago. Some areas in the forest preserves near the city have fair sized colonies of this species growing in them.

In soil preference this species is not overly particular as it can be found in rich prairies or on clay uplands. Full sun or light shade, as on the edges of thickets, is usual. In the open the branches arch gracefully and form a symmetrical mound, but near other plants the branches tangle and ramble over the other shrubs. The flowers are produced several weeks later than the common wild roses and are larger, in clusters, and are produced on short branches on the previous year's growth.

For large areas, on slopes, or for naturalizing this species has a charm all its own as well as a robustness that makes it absolutely dependable. Persons with semi-wild areas or large shrub borders will do well to introduce this overlooked native.

ELDRED E. GREEN.

Pinus sylvestris

One of the features of the subdivisions that originated during the last part of the nineteenth century in the Chicago region, and in farm plantings of that period was the use of the Scots pine as an accent among the deciduous trees that were generally set out. These pines are in evidence today. Sometimes they appear as isolated specimens marking the site of a long gone homestead, at others they mark the course of streets and parks, and still others mark the dreams of past years that never came true.

The age of these trees is probably their most distinctive feature as many of them can be found that are more than 12 inches in diameter and twenty-five or thirty feet high with a spread of twenty feet or more. The squat growth of most of these plants in the open has added to their value as garden subjects. Usually they are low branched, unless competing with taller deciduous material. The young bark is an attractive smooth reddish brown, while the old trunk bark is gray with medium flakes. The needles are stiff and dark green.

This species seems to be rather tolerant of a wide variety of soils and conditions and can be used as a picturesque accent in the landscape where some of the other evergreens will not thrive.

ELDRED E. GREEN.

Magnolia stellata

The star magnolia is one of the nicer shrubs that is little seen in the middle west because of the unfortunate idea that magnolias are tender subjects.

This magnolia might easily pass for some other plant as the resemblance to its larger more common relative is not pronounced. In this species the flowers are flat rather than cup shaped and are composed of many narrow petals. Technical characters of bud, and the structure of the floral parts serve as a clear indication of the botanical position of the plant.

The color is white, although there are forms of a light pink color and the flowers are about two to three inches in diameter. They are produced before the leaves and appear in the latter part of April in the Chicago area.

Precautions concerning magnolias have been previously mentioned, and apply to this species. This is the earliest of the magnolias to bloom here and combined with *M. soulangeana* and *M. nigra* will provide nearly a month of early flowers for the larger shrub border. *M. stellata* and *M. nigra* are small enough to be used as specimens or as component of shrub plantings. None of these magnolias needs any protection in this region.

ELDRED E. GREEN.

The "New Order" in the Garden

We all look for so much in Postwar Planning and while the achievement of our many individual aims seems remote we can survey garden prospects with a greater hope.

As in any project, sheer hard work must be welcomed but the easier route by mental process can be followed. Thinking can prove productive with a minimum of labor.

Research has gone far with Starter Solutions, Hortomones and the Rooting Compounds and the study of soil conditions yet progress beyond the fine degree of culture can not carry us far. Generations have "digged and delved" with intelligent observation of results and we can follow a routine of soil treatment that can yield results that are satisfactory. We gather seeds and sow with a fair certainty of the crop they will yield but "what of the seeds themselves?"

Some suppliers justly pride themselves on the quality they produce and from time to time improved strains are offered and fresh hybrids raised but a study over years of systematic handling of a species shows some facts that everyone should know.

Nature herself *knows no finality* and the improvement that gives a novel feature, through it sometimes can be the mere chance of a so-called "mutation" or a "sport," can also come from selective breeding.

Practically any species will respond and the earlier stages in the work can be slow and unproductive, but the further the project is carried the wider the variations that will show and these "wider variations" in turn will give parents capable of yielding a multiple of the good qualities they themselves possess.

When we can find a supplier who will pride himself on the improved quality of his seeds *each year*—not merely satisfied to "hold" to uniformity—we can be sure of gaining something towards the maximum we aim at and can look to the future with a surer hope.

Someone has done the work in the past. We order our annuals with a complaint at any deviation from color in the separated shades but let the home gardener set out to isolate "true breeding types" from the mixed heredity of some of our hybrids and he will gain a new respect for a generation that knew nothing of Mendel or of theories but observed intelligently and worked methodically.

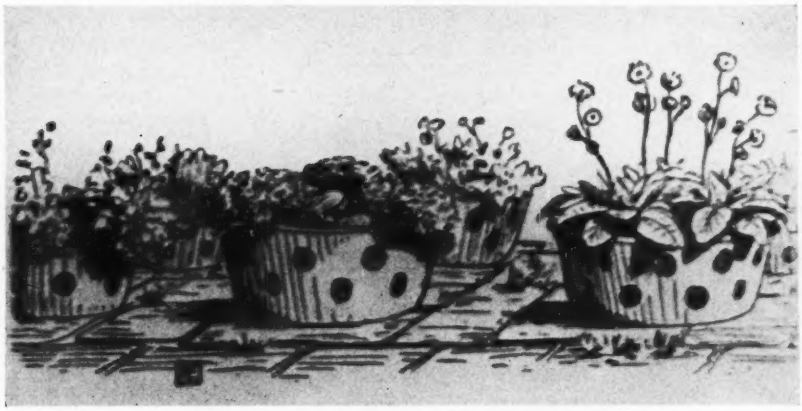
What are we doing in comparison?

The iris possibly is the most popular subject among plant breeders.

Anyone can purchase a few of the newer hybrids and raise seedlings with the joy of so many "treasures" and the chance of some distinctive color "break" that will give him a reputation as a breeder—sow enough seeds and it surely must come—but let us study the modern iris as a parent. During the first few years of this century the best of the varieties came from the older known species but with the advent of *Iris Mesopotamica* "things began to happen." Today you can "self-pollinate" the variety "Purissima" if you are lucky enough to find it yield pollen and gain seedlings of such uniform quality that you will want to see more —you wonder if anything poor could come. A study of "Purissima" parentage leads back only two generations with one element of doubt about a grandparent to the original species—*I. pallida, I. cypriana* and *I. mesopotamica.*

There is still the need of further trial but results so far suggest that we cannot expect any more satisfying uniformity nor as high an average of quality from any of the modern hybrids.

Where have the *years of progress* led? If we have not succeeded in raising the "Level of Parentage" over the years since "Purissima" came—in 16



Alpines Potted in Sphagnum (*see page 126*)

years and even it should have arrived 12 years earlier with the advent of *I. mesopotamica* dated as 1912—we have not achieved any real progress in breeding. We have merely produced varieties.

Figures can illustrate the other "side of the picture."

Among the Papavers—an unresponsive "clan"—a 100,000 to 1 dominance has been "swayed" to a 2 to 1 in 14 generations and Frank Reinelt has taken the same material others had had among the delphiniums and in the matter of six generations produced seed on a commercial basis breeding true to several color ranges. He would scorn the suggestion of returning even a few generations for a parent, unless to recapture a feature he had lost, each year showing a gain in "parent level" that he was keen to retain.

The simple fact remains that the reason we have so few floral novelties—with due thanks for those there are and holding faithfully to "tried and tested" strains—is because the workers have rarely been at the task of giving us something better and better still.

It is all very well to lay the blame but the question seems to be: *Why not produce* something ourselves?

There is no secret—no royal road to success but anyone can follow given the idea of what they intend to achieve with an open enough mind to welcome any fresh avenues nature herself will indicate and some order and system in the handling.

Can we picture the future all so near at hand? Seed producers working in conjunction with plant breeders providing every year a quality so much ahead of previous offering as to defy competition and a happy and willing band of enthusiastic gardeners each, generation after generation, impressing their own individuality on the plants they grow.

It only needs an effort and intelligent observation with care and certainty in the selection of parents—certainty of the pollen as well as seed origin—to produce so many distinctive ranges that the added variety will mean much and give the multiple of chance for nature to provide that generous bonus in the way of "sport" or "mutation" that can mean even more than the steady work of years.

The "call" is to all. Knowledge is a help but allowing for preliminary errors the average gardener can master the intricacies and within a few years stand with the expert in knowledge and results.

The "new order" in the garden is

"every one a breeder" and the multiple of effort not only yielding dividends but giving an interest and a satisfaction far beyond the largest and finest of blooms that can come from any seeds we buy.

FRED W. DANKS,
Victoria, Australia.

Sphagnum, of Old

In the October number of this magazine there was an interesting article on "Sphagnum Moss as a Seedling Medium." The mention of the fact that the United States Plant Introduction Garden at Glenn Dale, Maryland, had been using sphagnum moss for twenty years as a medium for seed propagation brought to mind a book written in French by the late Swiss horticulturist, H. Correvon, entitled "Plantes des Montagnes," wherein the author devoted a chapter to plant culture in sphagnum. Correvon, in this article, laid emphasis on the cultivation of difficult alpine plants rather than on that of seed germination. Incidentally he mentions that as long ago as 1891, he observed at the Botanic Garden of Pavia plants raised in sphagnum in full sun. A review of his methods may be of interest to rock gardeners and others who might be tempted to repeat his experiments.

Correvon states that one of the difficulties in raising alpines in a light loamy soil is that, during hot, dry summers, the leaves fail to receive enough moisture from the atmosphere, and thus tend to wither and often die. In the mountain these plants receive a constant supply of moisture from the soil. On the other hand, alpines grown in a damper climate, for example near the seashore, can endure much higher summer temperatures than they can in our central States. Briefly, heat, light and humidity are the three elements essential to the life of plants inhabiting the high mountains. Given heat and light, sphagnum will supply the third requisite, namely humidity, for it acts like a sponge, furnishing the necessary moisture to the leaves and stems of the plant. Naturally, where the climate is damp, alpines grown in sphagnum would be less likely to thrive.

Correvon, having placed some stones for drainage at the bottom of the pots, then filled them with old shredded sphagnum, and in this medium he placed difficult alpines, among which were Androsaces, Primulas and Soldanellas. Naturally there was no soil around the roots. All throve extremely well. He states that at the National Swiss horticultural exhibition, where they were displayed, he was awarded the much prized gold medal. The picture shown was taken from his book.

Correvon asserts that one disadvantage of keeping plants in sphagnum for any length of time is that they develop too rapidly, and produce such a mass of flowers that they are gradually weakened, and that after a year or two they should be taken out and divided, and possibly repotted in fresh sphagnum. However, he neglects to state how he kept the pots over the winter. The question arises whether plants grown in our Central States, where we have frequent periods of dull cloudy weather, would be able to survive, even in an alpine house.

The writer remembers that many years ago he tried the experiment of raising a few alpines in sphagnum. The plants were inserted in pots about the end of March, and placed in full sun. They throve exceedingly well for about four or five months, after which they seemed to languish. The plants were then withdrawn and, much to our disgust, we found a host of sowbugs which no doubt had been feeding on the roots and stems. At any rate, we had conducted the experiment long enough to prove to our satisfaction that difficult alpines could be raised in moss, even during the hot dry summers of southwestern Ohio.

ROBERT M. SENIOR.

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